The ART of

MEASURING,

Containing the

DESCRIPTION and EXPLANATION

OF THE

Carpenters New RULE.

Furnished with Variety of *Scales*, Fitted for the more speedy Mensuration of *Superficies* and *Solids*.

ALSO

Certain *Geometrical Problems*, a *Table of Logarithms* to 10000, and some Uses of the same Exemplified in *Arithmetick* and *Geometry*; but more particularly applied to the Mensuration of *Superficies* and *Solids*, as *Board*, *Glass*, *Pavement*, *Wainscot*, *Plaistering*, *Tyling*, *Timber*, *Stone*, *Brick-Work*, and *Gauging of Cask*.

The Third Edition with Additions, by W. Leybourn.

To which is Added

A SUPPLEMENT;

BEING

The Description of the *Line of Numbers*, with its Use, in divers Practical Examples of Mensuration; Of Singular Use for *Work-men*, *Artificers*, and other *Ingenious Persons* delighting therein.

LONDON, Printed for *Rich. Northcot* next St. *Peters Alley*, *Cornhill*, and at the *Marriner* and *Anchor* upon *Fish-street Hill*, near *London Bridge*. 1681.

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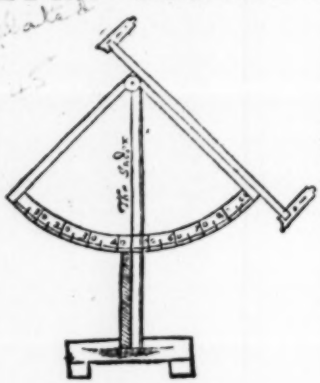

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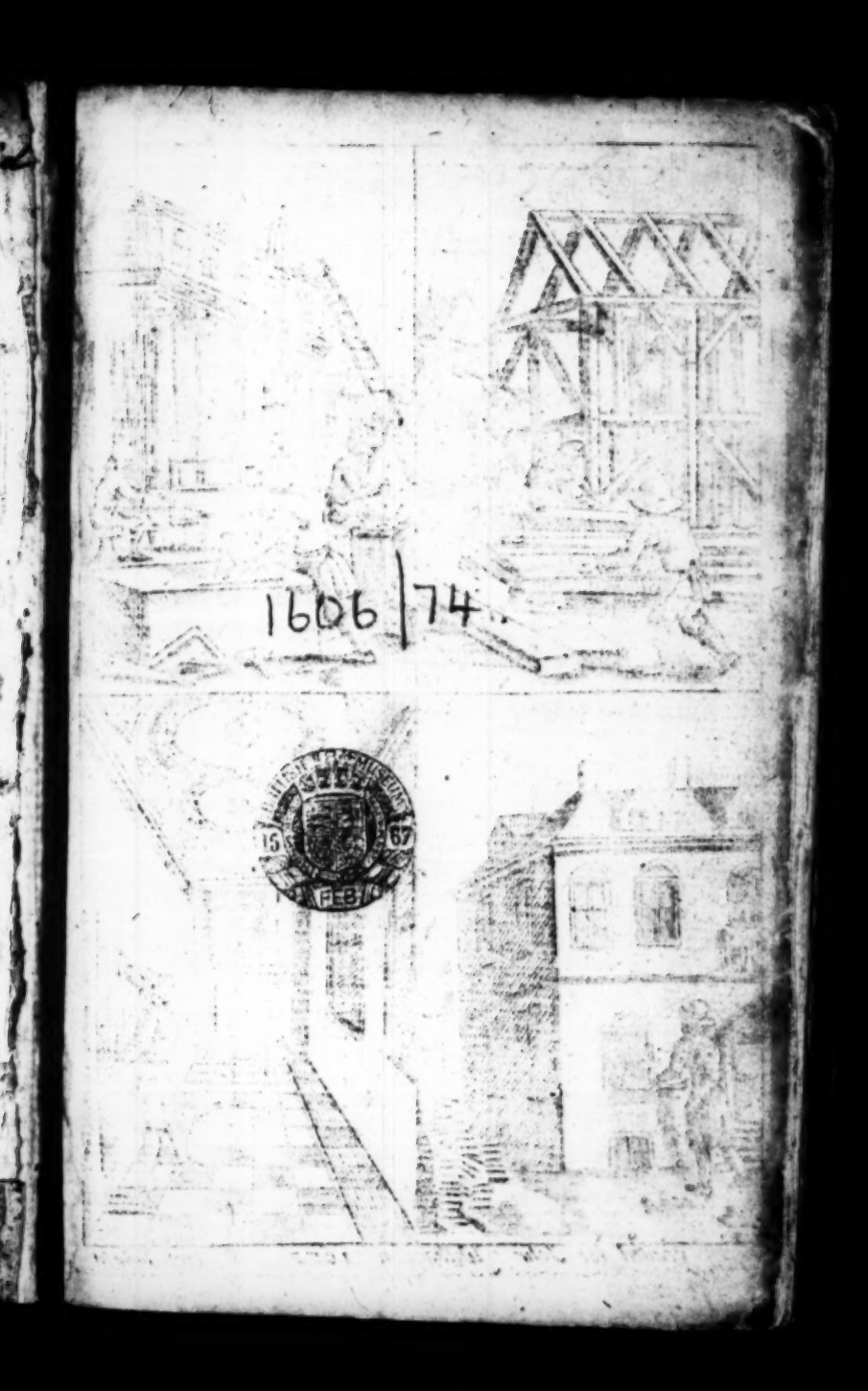
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The Publiſher's Preface to the Reader.

GEOMETRY, or the Art of *Meaſuring*, being the Subject of this ſmall Treatiſe; I preſume needs not court thy candid acceptation, ſince it contains ſo much variety of plain familiar Precepts and Examples, all conducing to the full information of the moſt ordinary Capacity, in theſe curious and delightful Speculations.

Geometry ſtands not in need of any *Rhetorick* to commend it, or to make it appear with the greater

Luſtre to the eye of the World; for it carries its force of Demonſtration along with it: the ſame I may ſay of *Arithmetick* alſo, which is the only Hand-maid to *Geometry*; upon which Foundation all Sciences *Mathematical* have their principal dependence; and from thoſe two Liberal Sciences alone infinite rare Concluſions may be drawn. Hence then, of what great and general uſe, eſpecially to Work-men and Artificers, a competent knowledge herein muſt needs be; I leave to any indifferent and unbyaſſed perſon to judge.

Now the drift and ſcope of this little Book, is, only to inſtruct thoſe who deſire to be acquainted with

with these ravishing Mysteries, and from hence such persons may be enabled to make a farther progress, and to proceed gradually, till they are capacitated for deeper enterprizes; let not the plainness of the Garb therefore discourage you from a free and generous entertainment, since so many useful, plain, and practical Conclusions are taught herein.

But now in order to the Readers satisfaction, I shall give a brief Account of the chief Heads contained in this small Treatise. They are principally these. (1.) You are presented with divers *Geometrical* Definitions and Problems, as a convenient Harbinger to what follows. (2.) You have some

brief eaſie ways laid down how to take Heights and Diſtances, by the help of no other Inſtrument than a *Two Foot Rule*, (a Carpenter's daily Companion,) or in the abſence thereof a *Square*, and ſometimes by both; which *Concluſions* often yield much delight to a Workman, as well as others. (3.) You have the Deſcription and uſe of a *Two Foot Ruler*, with divers Scales placed thereon, after a new Method; by which you are inſtructed how to Meaſure ſeveral *Superficies* and *Solids*, illuſtrated by Examples, which Rule was contrived by that excellent *Mathematician* Mr. *Samuel Foſter*, once Reader of *Aſtronomy* in *Greſham-Colledge*. Alſo ſeveral *Arithmeti-*

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brief eaſie ways laid down how to take Heights and Diſtances, by the help of no other Inſtrument than a *Two Foot Rule*, (a Carpenter's daily Companion,) or in the abſence thereof a *Square*, and ſometimes by both; which *Concluſions* often yield much delight to a Workman, as well as others. (3.) You have the Deſcription and uſe of a *Two Foot Ruler*, with divers Scales placed thereon, after a new Method; by which you are inſtructed how to Meaſure ſeveral *Superficies* and *Solids*, illuſtrated by Examples, which Rule was contrived by that excellent *Mathematician* Mr. *Samuel Foſter*, once Reader of *Aſtronomy* in *Greſham-Colledge*. Alſo ſeveral *Arithmeti-*

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forementioned Tractate is subjoyned, (for variety sake) a *Supplement* containing the *Description of the Line of Numbers*, with its Use explained, and illustrated with divers familiar Examples in the Art of *Measuring*; so that 'tis supposed there is nothing left wanting, which may be serviceable to the Artificer, either in the Theory or Practick part of *Mensuration*. All which is digested into this small pocket Volume, and fitted to the understanding of mean capacities. Thus not doubting of your kind Acceptance, wishing you much pleasure in the perusal, and all happiness in your honest endeavours, I bid thee at present Farewel.

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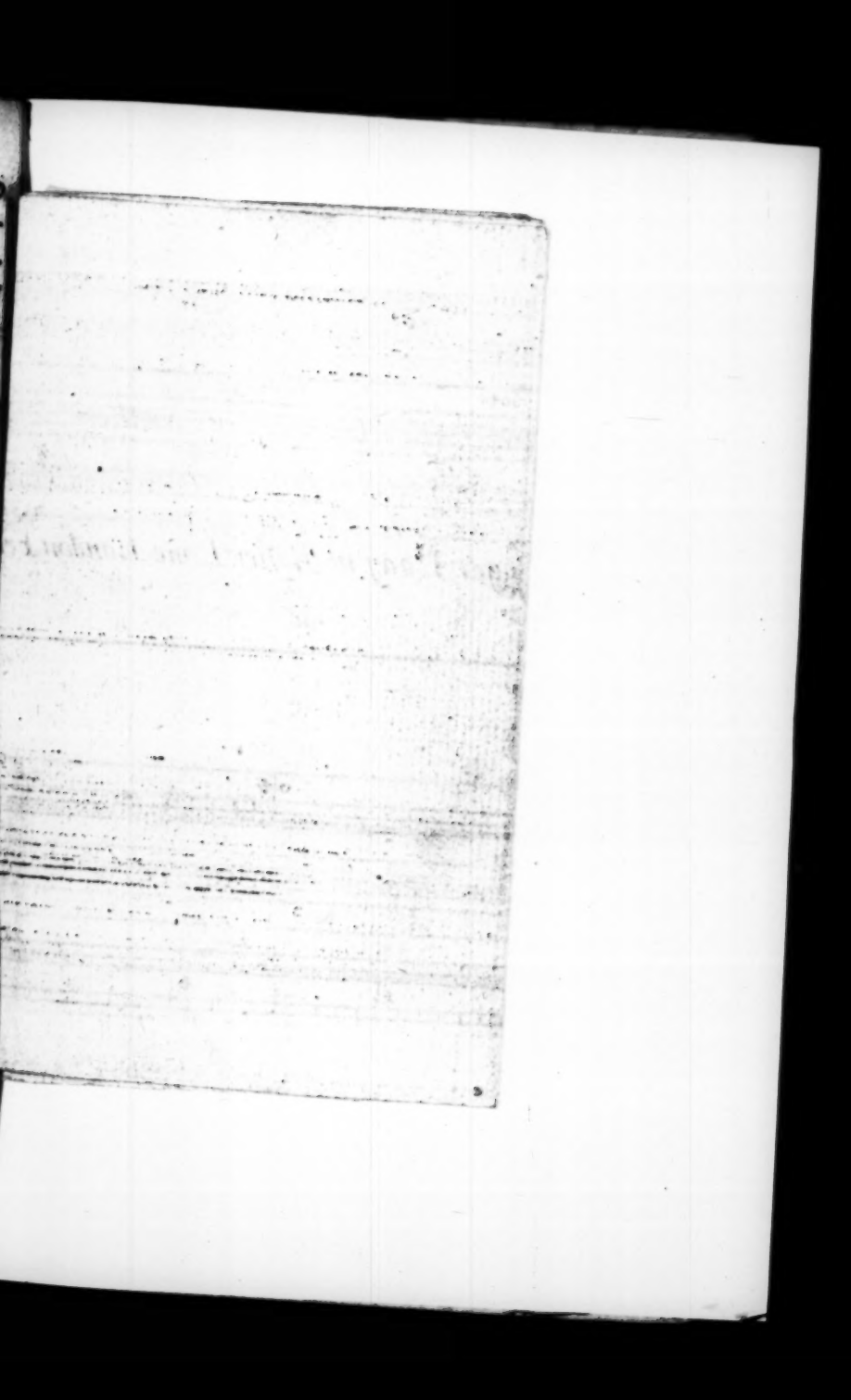
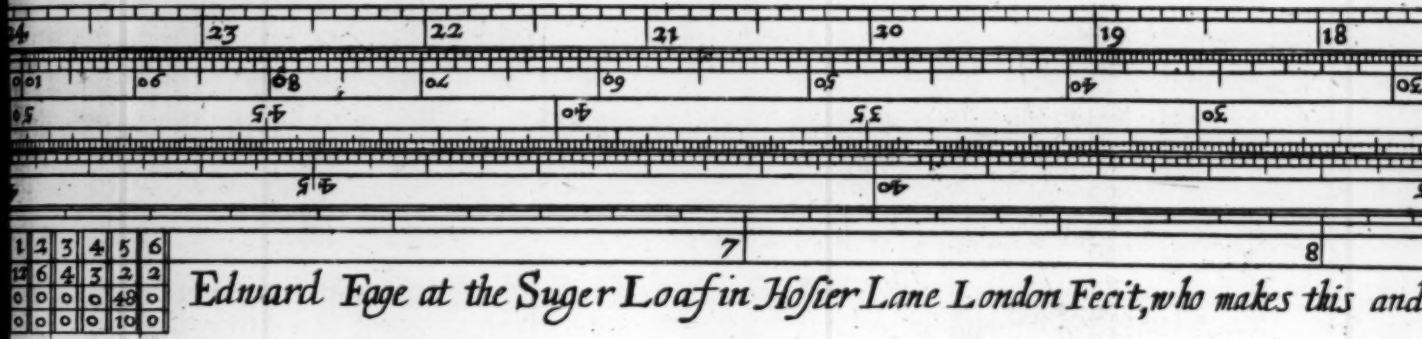
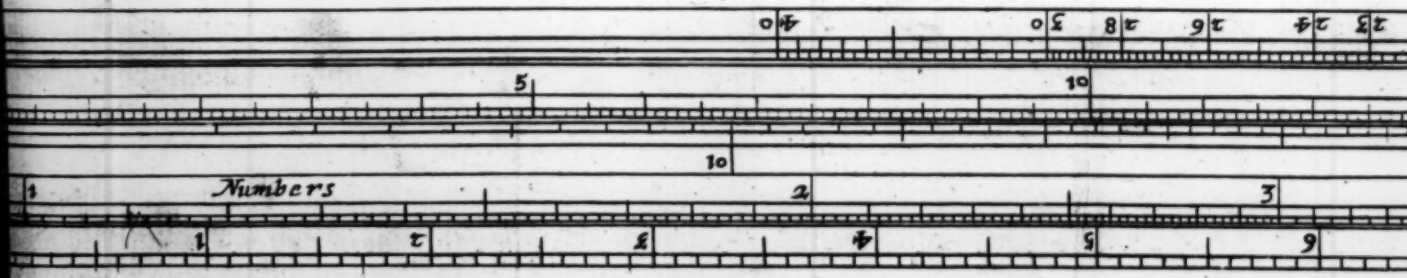
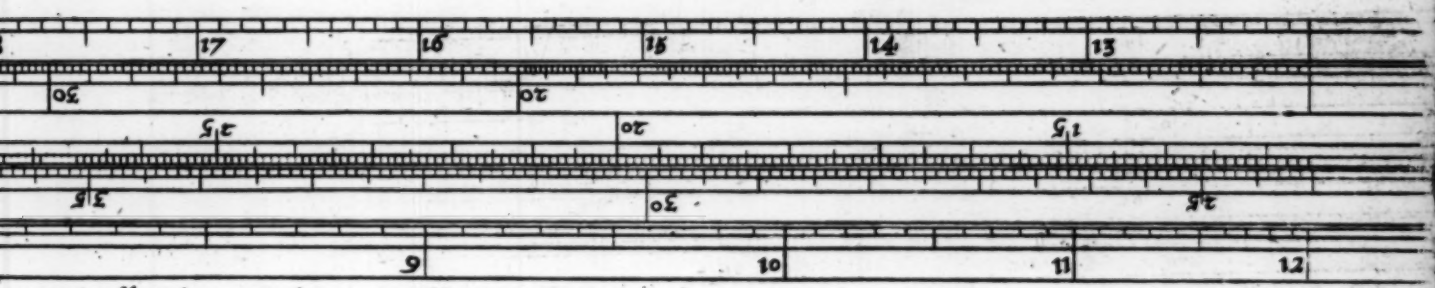
Definitions





Edward Fage at the Suger Loaf in Hosier Lane London Fecit, who makes this and





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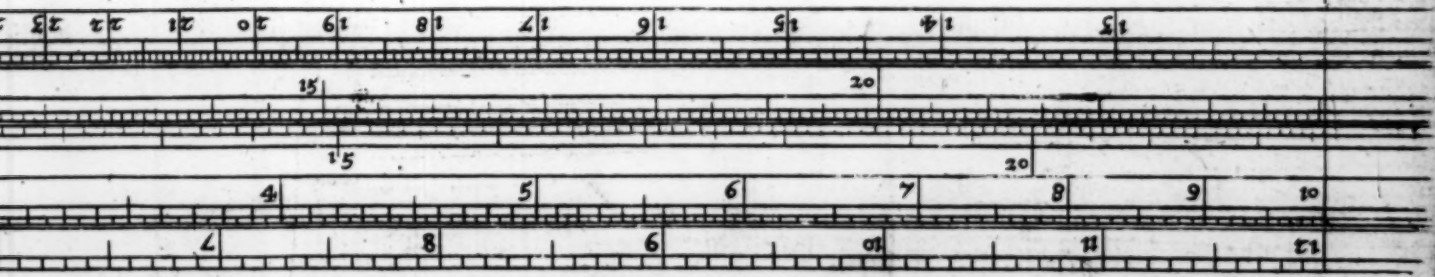
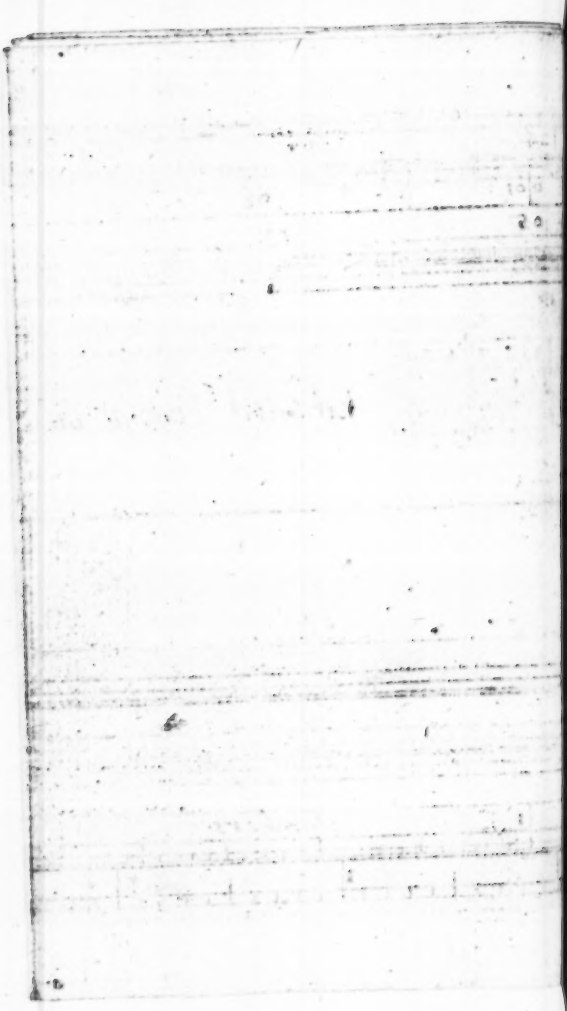




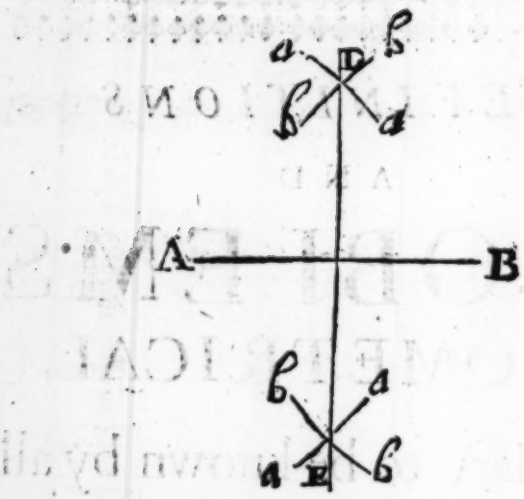
DEFINITIONS AND PROBLEMS GEOMETRICAL,

Necessary to be known by all *Artificers*, for their furtherance in the practice of their several *Vocations*.

PROBL. II.

How to divide a Line into two equal Parts by a Perpendicular.

LEt A B be a Line given, to be divided into two equal Parts in the Point C by the Perpendicular Line D E.



First, Open your Compaſſes to any diſtance greater than half the length of the given Line, then ſetting one foot in A, with the other foot deſcribe the Arches of a Circle *a a* and *a a*, both above and below the given Line.

Secondly, Set one Foot of the Compaſſes in B, and with the other Foot deſcribe two other Arches of a Circle *b b* and *b b*, croſſing the two former in the points D and E.

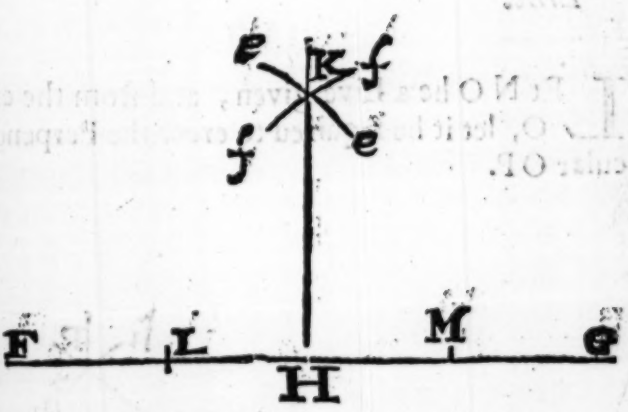
Laſtly, Draw a right Line from D to E, and it ſhall divide the given Line A B in two equal parts in the point C, and ſhall alſo be perpendicular thereunto.

PROBL. II.

PROBL. II.

How from any Point in a given right Line, to erect a Perpendicular.

LEt F G be a right Line given, and unto it (from the Point H;) let it be required to erect the Perpendicular H K.



First, Open your Compasses to any small distance, and setting one foot in the Point H, with the other foot make the two marks L and M.

Secondly, Open the Compasses to any other distance, (greater than the former) and setting one foot in L, with the other describe the Arch *e e*; And removing the Compasses to M, describe the Arch *f f*, crossing the former in the point K.

PROBL. III.

To erect a Perpendicular upon the end of a Line.

LEt N O be a Line given, and from the end O, let it be required to erect the Perpendicular O P.

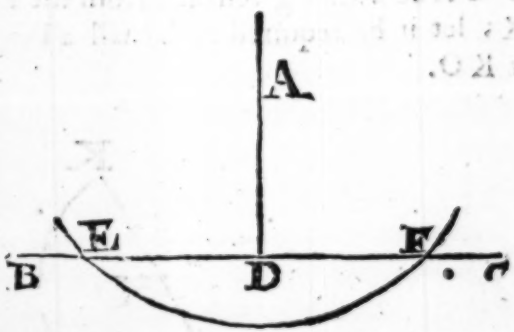
First,

First, Open your Compaſſes to any ſmall diſtance, and ſetting one foot in O, pitch down the other foot at adventure, as at the point Q; the Compaſs point reſting in Q, turn the other about till it croſs the given Line in the point R, and the foot ſtill reſting in Q, with the other deſcribe the Arch of a Circle *b b* over the given point O; And laying a Ruler from R to Q; it will cut the Arch *b b* in P.

Laſtly, Draw the Line P O, which ſhall be Perpendicular to the given Line N O.

PROBL. IV.

From a Point given, to let fall a Perpendicular upon a Line given.



LEt B C be a Line given, and from the point A, let it be required to let fall the Perpendicular A D,

First, Open your Compaſſes to any diſtance greater than the neareſt diſtance that can be taken between the Point A, and the Line B C; And ſetting one foot of the Compaſſes in A, with the other deſcribe the Arch E F.

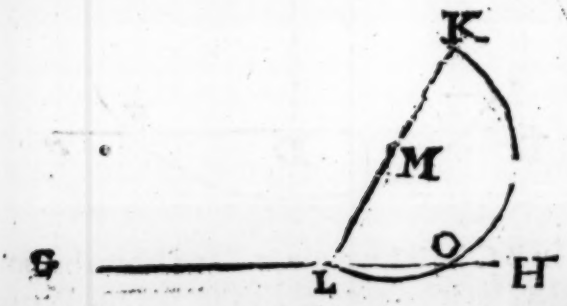
Secondly, (By the firſt Probl.) Divide the Line E F in two equal parts in the Point D.

Laſtly, Draw the Line A D, which ſhall be Perpendicular to BC, and from the given point A.

PROBL. V.

How to let fall a Perpendicular from a Point given, which is juſt over (or near) the end of a right Line.

LEt G H be a Line given, and from the Point K; let it be required to let fall a Perpendicular K O.



First,

First, From the Point K draw a right Line K L, croſſing the given Line G H, which Line divide into two equal parts in the Point M; Then ſetting one foot of the Compaſſes in M, open the other to the Point K, and deſcribe the Semi-Circle K O L, cutting the given Line G H in the Point O.

Laſtly, Draw the Line K O, which ſhall be Perpendicular to G H, and near to the end thereof.

PROBL. VI.

A Right Line being given, how to draw another Right Line, which ſhall be parallel thereunto, at any diſtance required.

LEt A B be a Right Line given; and let it be required to draw another Line C D Parallel thereunto at the diſtance of the length of the Line E.

First, Take in your Compasses the length of the Line E, and setting one foot of the Compasses in A, with the other describe the Arch of a Circle *m m*. Then remove the Compasses to B, and describe another Arch *n n*.

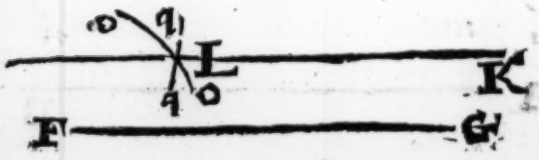
Lastly, Lay a Ruler to these two Arches *m m*, and *n n*, so that it may only touch the very tops of them, and draw the Line C D, which shall be parallel to A B, and at the distance of the given Line E.

PROBL. VII.

To draw a Right Line parallel to another Right Line, which shall pass through a Point assigned.

LEt F G be a Right Line given, to which let it be required to draw another Line K parallel thereunto, which shall pass directly through the given point K.

The first Variety.



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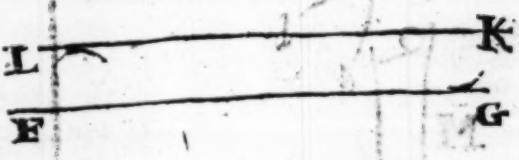
The Second Variety.



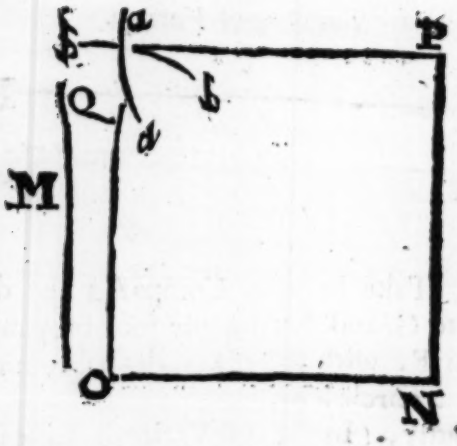
First, Take in your Compaſſes the diſtance from K to G, and ſetting one foot of your Compaſſes in F, with the other deſcribe an obſcure Arch of a Circle *o o*.

Secondly, (In the firſt Variety) Take in your Compaſſes the whole length of the Line F G, and ſetting one foot of that extent in K, with the other deſcribe another obſcure Arch *q q*, croſſing the former in the point L. A Line drawn from K to I, ſhall be parallel to F G.

PROBL. VIII.

How to make a Geometrical Square, whoſe ſides ſhall be all equal to a right Line given.

LEt M be a Line given, and let it be required to make the Geometrical Square N O P Q, whoſe ſides (each of them) ſhall be equal to the given Line M. First,



First, Draw the Line NO equal in length to the Line M; and upon the end thereof N, (by the third Problem) erect the Perpendicular NP, equal in length also to the given Line M.

Again. Take the Line M in your Compasses and setting one foot of them in P, with the other describe the Arch *a a*. Also set one foot in O, with the other describe the Arch *b b*, cutting the former Arch in the Point Q.

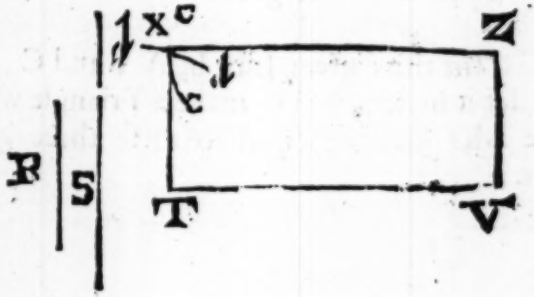
Lastly, Draw the Lines QP, and QO, so shall you have formed the Geometrical Square NOPQ.

PROBL. IX.

PROBL. IX.

How to make a long Square or Parallelogram, whose sides shall be equal to any two Lines given.

LEt R and S be two Lines given, and let it be required to make the Parallelogram T V Z X, whose two shorter sides shall be equal to the Line R, and whose longer sides shall be equal to the Line S.



First, Take in your Compasses the length of the longer Line S, and draw the Line T V equal thereunto, and upon V erect the Perpendicular V Z equal to the Line R.

Secondly,

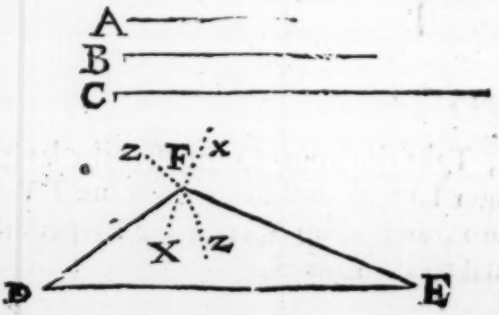
Secondly, Take the Line S in your Compaſſes, and ſetting one foot in Z, deſcribe the Arch *e e*; Alſo take in your Compaſſes the length of the Line R, and ſetting one foot in T. with the other deſcribe another Arch *d d*, croſſing the former in the Point X.

Laſtly, Draw the two Lines X and Z, and X T, ſo ſhall they include the Parallelogram T V Z X.

PROBL. X.

How to make a Triangle, whoſe three ſides are equal to three given right Lines.

LEt the three given Line be A B and C, and let it be required to make a Triangle whoſe three ſides ſhall be equal to theſe three given Lines.



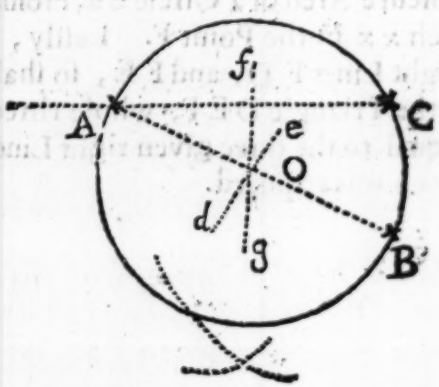
First,

First, Take in your Compasses the longest of the given Lines, and draw a Line as D E equal in length thereto; Then Secondly, Take in your Compasses the lengh of the given Line B, and setting one foot of the Compasses in E, with the other describe an obscure Arch of a Circle x x; Then Thirdly, Take in your Compasses the length of the given Line A, and setting one foot of that extent in D, with the other describe another obscure Arch of a Circle z z, crossing the former Arch x x in the Point F. Lastly, Draw the two right Lines F D, and F E, so shall they constitute the Triangle D E F, whose three sides shall be equal to the three given right Lines A B and C, which was required.

PROBL. XI.

PROBL. XI.

Having three Points given, how to draw a Circle that ſhall exactly paſs through thoſe Points, provided that all the three Points be not ſeated in a ſtreight Line.



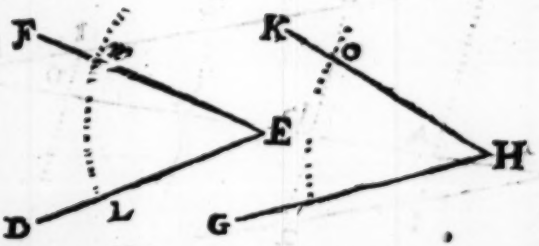
LEt the three given Points be A B and C, Firſt, of the three Points make a Triangle by drawing the Lines A B, B C, and C A; Then by the firſt Problem, divide any two of the ſides into two equal parts at right Angles, as in the Figure; the ſide of the Triangle A B is divided at right Angles into two equal parts by the Line *d* and the ſide A C of the Triangle is divided into two

two equal parts, and at right Angles by the Line *f g*. Now where these two Lines *d e* and *f g* do cross each other in the Point O, so is O the Centre of a Circle, in which if you set one foot of your Compasses, and extend the other to any of the three given Points A B or C, the Circumference shall pass through the three Points which was required.

PROBL. XII.

How to make an Angle equal to an Angle given.

LEt D E F be an Angle given, and let it be required to make another Angle G H K, equal thereunto.

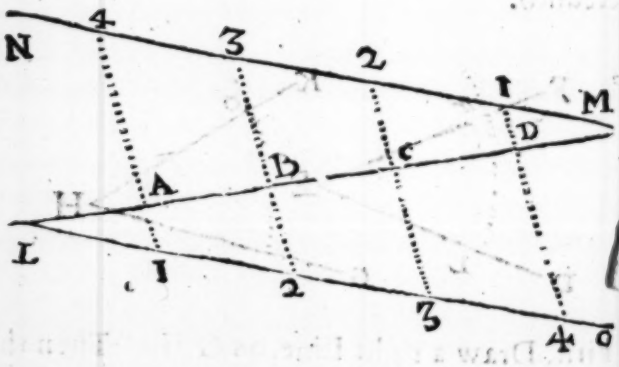


First, Draw a right Line, as G H. Then the Compasses being opened to any convenient distance,

ſtance, ſet one foot in the given angular Point E, and deſcribe an obſcure Arch of a Circle, as *l m*, which muſt cut both the ſides of the Angle F E and D E. Secondly, the Compaſſes ſtill remaining at the ſame diſtance, ſet one foot in H, and with the other foot deſcribe an obſcure Arch of a Circle *n o*, making *n o* equal to *l m*. Laſtly, From H through the Point *o*, draw a right Line H K, making the Angle K H G equal to D E F as was required.

PROBL. XIII.

How to divide a right Line given, into any number of equal parts.

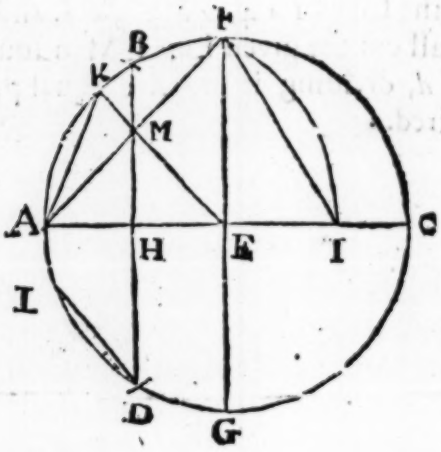


Let

LEt L M be a right Line given, to be divided into five equal parts. First, From one end thereof, as from L, draw a right Line at pleasure. as L O, making the Angle M L O. Secondly, From M draw another Line M N parallel to L O by the Seventh Problem, or by the last Problem, make the Angle N M L equal to M L O. Thirdly, Open your Compasses to any small distance, as M 1, or L 1, and with that distance run the Compasses along the Lines M N, and L O, four times (because the Line is to be divided into five parts) at the Points 1, 2, 3 and 4. Lastly, draw the Lines 1 *a* 4, 2 *b* 3, 3 *c* 2, and 4 *d* 1, which shall cut the given Line L M in four parts *a b c* and *d*, dividing it into five equal parts, as was required.

PROBL. XIV.

A Circle being given, how to divide the same into any number of equal parts, not exceeding Ten; that is, how to inscribe any Figure of 3, 4, 5, 6, 7, 8, 9, 10. Sides within any Circle.



Let

LEt AFCG be a Circle given, and let it be required to find the ſide of a

Triangle	or Figure of	3	Sides that will be inſcribed within the ſame Circle.
Square		4	
Pentagon		5	
Hexagon		6	
Heptagon		7	
Octogon		8	
Nonagon		9	
Decagon		10	

Firſt, Through the Centre E draw the Line or Diameter of A E C dividing the Circle into two equal parts.

Secondly, Take in your Compaſſes half the Diameter A E or E C, and ſetting one foot in A, with the other make the marks B and D, and draw the Line B D, which ſhall be the ſide of a Triangle that will be inſcribed in that Circle.

Thirdly, Draw the Line F G through the Centre, cutting the Diameter A C at right Angles, and draw the Line A F, which ſhall be the ſide of a Square which will be inſcribed in that Triangle.

Fourthly, Set one foot of the Compaſſes in H, and extend the other in F, drawing the Arch Line F I; then draw the right Line F I, which ſhall be the ſide of a Pentagon, which will be inſcribed within the Circle.

Fifthly, Any of the Semidiameters E A, E C, E F or E G are the ſides of a *Hexagon* or Figure of ſix ſides, that may be inſcribed in the Circle.

Sixthly, Half of the Line B D, namely, H B, or H D are the ſides of a *Heptagon*, or ſeven ſided Figure, that will be inſcribed in that Circle.

Seventhly, Divide the Line A F into two equal parts in M, and draw the Line E M K, cutting the Circumference of the Circle in K, ſo ſhall a Line drawn from A to K, be the ſide of an *Octagon*, that may be inſcribed within the Circle.

Eighthly, divide the part of the Circumference of the Circle D A B into three equal parts, one third part whereof is from D to L, ſo a Line drawn from D to L, ſhall be the ſide of a *Nonagon* or Figure of nine ſides that may be inſcribed within this Circle.

Laſtly, The Line E I is the ſide of a *Decagon* or Figure of 10 ſides that may be inſcribed in this Circle.

By this laſt Problem *you are taught how to find the ſide of any regular Figure that may be inſcribed within a Circle, not exceeding one of ten ſides: I ſhall now proceed to ſuch* Problems *as concern the inſcribing and circumſcribing of Circles about ſuch regular Figures.*

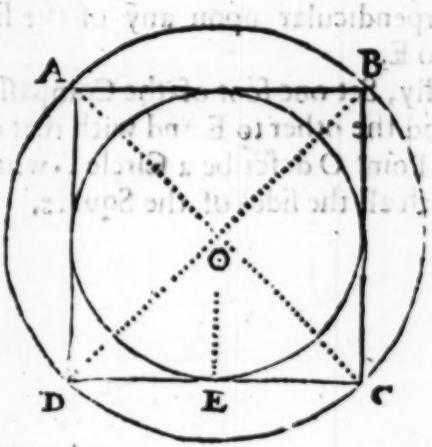
PROBL. XV.

PROBL. XV.

How to Circumſcribe a Circle about a Square.

LEt A B C D be a Square given, about which let it be required to deſcribe a Circle.

Firſt from either oppoſite Angle of the given Square, as from A to C, and from B to D, draw the two *Diagonals* B D and A C, croſſing each other in the Point O.



Secondly, Set one foot of the Compaſſes in the Point O, and open the other to any of the Angles of the Square, as from O to A, with that diſtance deſcribe a Circle, and it ſhall touch all the four Angles A B C and D, which was deſired.

PROBL. XVI.

To Inſcribe a Circle within a Square.

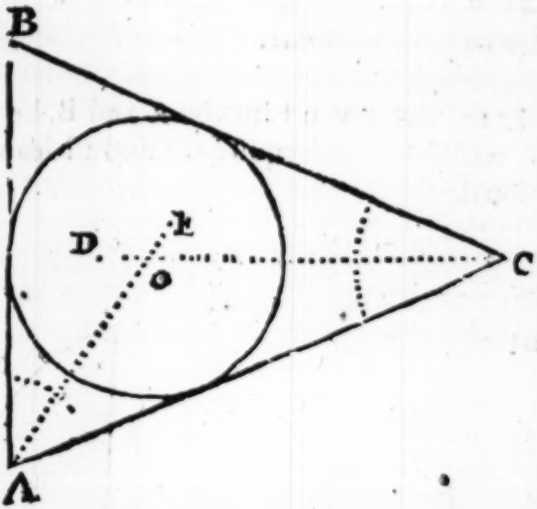
FIrſt, Draw the Diagonals A C and B D as in the laſt Problem; then from the Point O let fall a Perpendicular upon any of the ſides, as from O to E.

Secondly, Set one foot of the Compaſſes in O, and extend the other to E, and with that diſtance upon the Point O deſcribe a Circle, which ſhall juſtly touch all the ſides of the Square.

PROBL. XVIII.

To inſcribe a Circle within a Triangle.

LEt A B C be a Triangle given, within which let it be required to inſcribe the largeſt Circle that may be, which ſhall touch all the three ſides thereof.

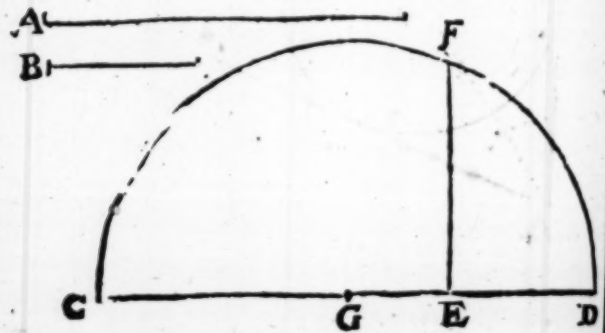


First, Divide any two of the Angles of th Triangle into two equal parts, as the Angle BCA and BAC, by the Lines CD and AE cutting each other in the Point O, ſo ſhall O b a Centre, upon which if you deſcribe a Circle, i ſhall only juſt touch the three ſides of the Tri angle, and ſhall be the largeſt Circle that can b inſcribed within the Triangle.

PROBL. XIX.

Between two right Lines given, to find Mean proportional.

LEt the two given Lines be A and B, betwee which let it be required to find a Mean Pro portional.

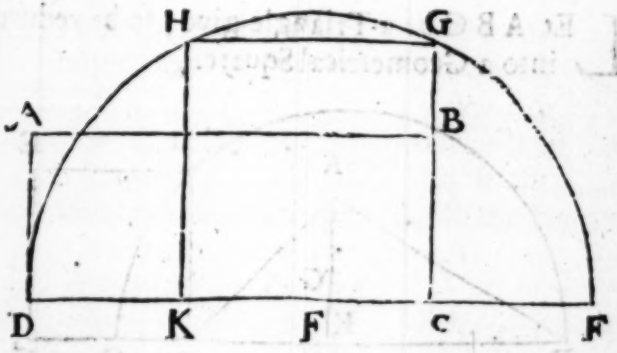


Let

Let the two Lines given A and B be joyned together in one right Line, C D in the Point E, which Line C D divide into two equal parts in the Point G, upon which Point G, describe the Semicircle C F D; then upon the Point E, where the two Lines A and B were joyned, erect a Perpendicular E F, which shall only touch the Semicircle in F, so shall the Line E F be a Mean Proportional between A and B, which was required.

PROBL. XX.

To take a Geometrical Square which shall be equal in Area *to a long Square or* Parallelogram.



LEt the long Square A B C D be given to be reduced into a Geometrical Square retaining the same quantity.

First,

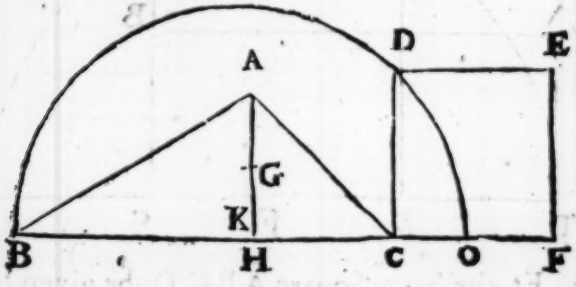
First, Continue the ſide D C of the long Square to E, making C E equal to C B the ſhorter ſide of the long Square.

Secondly, Divide the Line D E into two equal parts in F, upon which Point F, with the diſtance F D or F E deſcribe the Semicircle D G E, and continue the ſide C B to G, ſo ſhall G C be the ſide of the Geometrical Square C H G K, which ſhall be equal in quantity to the long Square A B C D.

PROBL. XXII.

How to make a Geometrical Square equal to a Triangle given.

LEt A B C be a Triangle give, to be reduced into a Geometrical Square.



Extend the ſide of the Triangle B C, to O, making C O equal to half the length of the Perpendicular

pendicular of the Triangle H G. Secondly, Divide the Line B O into two equal parts in K, and upon K at the distance K B describe the Semicircle B D O, and upon C erect the Perpendicular C D, to touch the Semicircle in D, so shall C D be the side of a Geometrical Square equal to the given Triangle A B C.

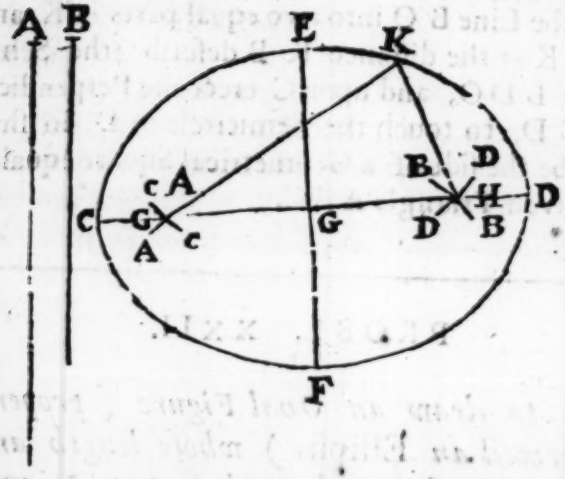
PROBL. XXII.

How to draw an Oval Figure (properly termed an Ellipsis *) whose length and breadth (or rather whose two Diameters) are limited.*

THe manner of prescribing of an Oval according to the way prefixed in the foregoing Problem is limited; for if it be drawn of any length, the breath thereof will be alwayes in the same proportion to the length; But in this it is otherwise, for it teacheth how (both the length and breadth being given) to describe an Oval (or *Ellipsis* rather) at one sweep;

Wherefore, Let it be required to describe such a Figure whose length shall be equall to the Line A, and whose breadth shall be equall to the Line B.

First,



First, Draw two Lines C D equal to the given Line A, and E F equal to the given Line B, croſſing each other at right Angles, and dividing each other into two equal parts in the Point C. Secondly, Take in your Compaſſes half the length of the longeſt Diameter C D, *viz.* G C or G D, & with that extent of the Compaſſes ſet one foot in E, and with the other croſs the longer Diameter with two obſcure Arches *c c* and *b b*; and with the ſame extent of the Compaſſes, ſetting one foot in F, croſs the two former obſcure Arches *c c* and *b b* with two other obſcure Arches *a a* and *d d*, croſſing the two former in the Points G and H.

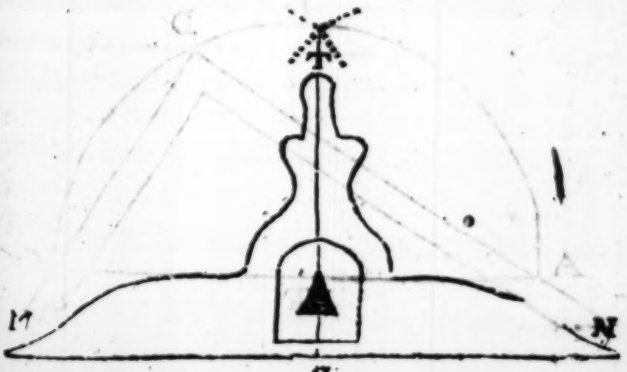
Thirdly, In the two Points G and H faſten two ſmall Pins, or ſmall Tacks, and putting a String about

about them, tie the ends thereof together at the length of the Line G D, ſo that the String may move about both the Pins G and H together, and being extended, will reach juſt to C, to E, to D, or F, and with a Tracer or Black-Lead Pencil, being lead about by the Hand, will deſcribe a perfect *Elipſis* or Oval-like Figure, as may be plainly ſeen in the *Diagram*.

PROBL. XXV.

How to make a Level, *which Artificers call a* Triangle *or* Plumb-Line, *if ſuch Tools as thoſe were loſt.*

THe Firſt & Second Problems in this caſe will help you; Wherefore in the following Fi-



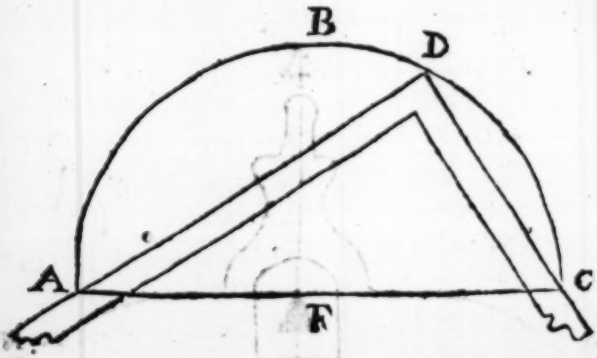
gure

gure having drawn the Line M N, about the middle whereof at S erect the Perpendicular S T: and thus by raising of a Perpendicular upon two Boards, or one fitted for this purpose, you may find your Level or Plumb-line, and so frame your Instrument for your use, if all other helps (as your Square, *&c.*) were wanting to make it by.

PROBL. XXVI.

How to make a Square, if another be wanting to make it by.

FIrst, Draw a right Line A C, which divide into two equal parts in the Point F, and upon F as a Centre describe the Semicircle A B C.



Secondly,

Secondly, In any part of the Circumference thereof make a Point as D. From which Point two right Lines being drawn to A and C, they shall constitute a Square or right Angle at the Point D; and so two pieces of Wood so framed, shall be a true Square.

These are such Definitions and Problems, as I know to be most useful and necessary for all sorts of Artificers, as Carpenters, Joyners, Masons, &c. *I shall now shew how the Ingenious Artificer may attain to the taking of Heights and Distances by help of this Square, and two Foot Rule.*

How the Ingenious Artificer may by help of his Square, and two Foot-Rule, attain to the taking of Heights and Distances.

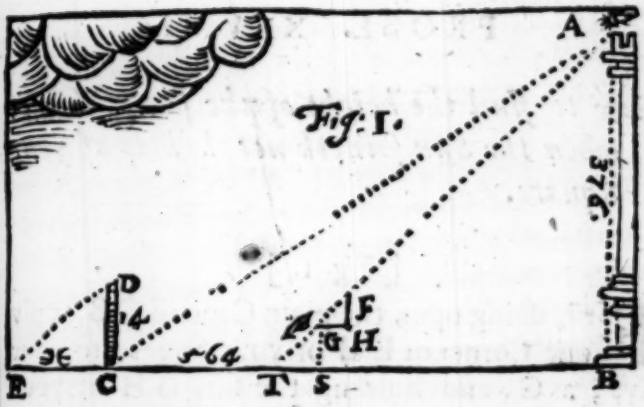
PROBL. XXVII.

How by help of your two Foot-Rule, to take the Height of any Tree, Tower, or Steeple, by the Shadow thereof.

LEt A B be a Tree, Turret, Steeple, May-Pole, or the like, casting its Shadow upon plain ground from B to C, and you would know the Height thereof.

First, at C, or on any other plain ground, erect your two Foot-Rule perpendicular, and observe how far that casteth its shadow, which suppose to E, at the same time that the Turret A B casts shadow to C.

Secondly,



Secondly, Make two Marks upon the Ground, where both the ſhadows terminate; one at C, and the other at E. Then

Thirdly, Meaſure the length of the ſhadow of your two Foot-Rule E C, which ſuppoſe to be 36 Inches; Alſo meaſure the length of the ſhadow of the Turret B C, which ſuppoſe to be 47 Foot, or 564 Inches; theſe two meaſures being obtained, you may come to the knowledge of the height of the Tower, as followeth.

Fourthly, Multiply 564, the length of the ſhadow of the Turret by 24 (the number of Inches in your two Foot-Rule) and the Product will be 13536, which being divided by 36 Inches, the length of the ſhadow of your Rule, giveth in the Quotient 376 Inches, which is 31 Foot, and four Inches, and that is the height of the Tower A B.

PROBL. XXVIII.

How to find the height of the ſame Turret when the Sun ſhineth not, by help of your Square.

[*Fig.* 1.]

FIrſt, Being upon the plain Ground C B, apply one Corner or End of your Square to your Eye, as G, and holding the ſide G H of your Square Level (which you may do by having a Thred and Plummet faſtned at F,) move towards the Turret, till by your Eye, and the two Arms of your Square G and F, you ſee the very top of the Turret at A.

Then Secondly, Note the place of your ſtanding, which will be at S, and from S, backwards to T, meaſure the heights of your Eye from the Ground.

Laſtly, Meaſure the diſtance from T to B, which diſtance ſhall be equal to the height of the Turret A B.

PROBL. XXIX.

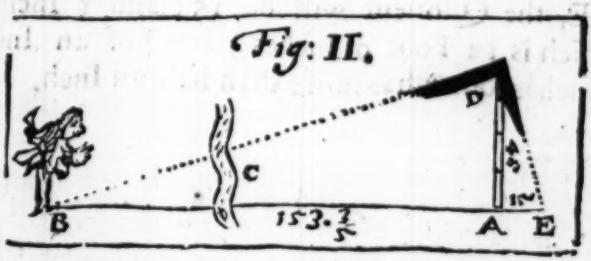
How by the help of your Square to find the distance from you to some other place that you can see, though you cannot come near the same.

[*Fig.* 2.]

Suppose you were standing at A, and it were required of you to find how far you are distant from the Tree at B, which you cannot come near to, because of the River at C.

First, At A, (the place of your standing) erect a Staff, as A D, of a known length; as suppose 4 Foot, or 48 Inches, having a Notch cut in the top

Fig. II.



thereof, in which the Square must hang so, that it may be moved upwards or downwards at plea-

ſure; Your Square hanging thus upon the top of the Staff, direct the end of it towards the Tree at B, and with your Eye look along the ſide of the Square, till you ſee the very bottom of the Tree at B.

Then keeping the Square thus fixed, ſtrain a ſmall Thred or Line from the corner of the Square at D along the ſide thereof, till it touch the ground at E.

This done, Meaſure the diſtance from A to E, which ſuppoſe to be one Foot and a quarter, or 15 Inches.

Then, to find the diſtance A B, ſo many times as A E is contained in A D, ſo many times is A D the length of the Staff, contained in A B the diſtance required.

Wherefore, Multiply 48 Inches the length of the Staff by 48. and the Product will be 2504, which being divided by 15 Inches, the diſtance A E, the Quotient will be 153 and $\frac{4}{5}$ Inches, which is 12 Foot 9 Inches, and $\frac{4}{5}$ of an Inch, which is ſomewhat more than half an Inch.

PROBL. XXX.

The length of a Ladder being known, and how far the Foot thereof is distant from the bottom of any Wall against which it standeth being also known, to find to what height of the Wall the Ladder reacheth.

[*Fig.* 3.]

THere is a Ladder, as A B, which is 35 Foot long, and it is set against a Wall, so that the

Fig. III.

Foot

Foot of the Ladder at B is removed from the bottom of the Wall at C 21 Foot; I would know what height of the Wall the Ladder reacheth, that is, I would know what is the height of A C.

First, Multiply 35 the length of the Ladder by 35, and the Product will be 1225. Alſo Multiply 21 (the diſtance which the Ladder ſtandeth from the Wall) by 21, the Product is 441, which being Subſtracted from the former 1225, there remains 784, the Square Root whereof being extracted is 28, and ſo high doth the Ladder reach upon the Wall from C to A.

PROBL. XXXI.

The length of a Ladder being known, to find at what diſtance it muſt ſtand from the Wall, to reach to ſuch a height as ſhall be deſired.

THe Ladder A B is 35 Foot long, and it is required to ſet it againſt the Wall C A, ſo that it may reach to 28 Foot. Multiply the Ladder 35 by 35, the Product is 1225, as before; alſo Multiply 28 by 28, the Product is 784, which Subſtract from 1225; there remains 441, the Square Root whereof being Extracted, is 21, and ſo ma-

ny

ny Foot muſt the Ladder be removed from the bottom of the Wall.

I might here inſtance in divers other the like Concluſions, but they require more Arithmetical skill, than is uſual among Artificers. Wherefore I will reſerve them, and divers others to be reſolved by the following Table, which performeth them with great eaſe and exactneſs,

A DIRECTION For *PLAIN & SOLID* MEASURE By the Ordinary 2 *FOOT RULER*; Furniſhed with *SCALES* neceſſary for that purpoſe.

The Ruler is furniſhed with five Scales.

I. A SCALE of equal Inches, ſtanding at one edge of the Ruler; Numbered from 1 to 24, each Inch is Subdivided into 10 equal Parts. This is called therefore, The SCALE *of* DECIMAL INCHES.

II. An unequal Scale, ſet alſo at another edge of the Ruler, Numbred from 6 down to 60: each of theſe greater parts is Subdivided into 10 leſſer parts, actually where there is room, or elſe ſuppoſedly when the Spaces grow ſhorter. To the beginning of this Scale is annexed a little Table, ſupplying thoſe main Diviſions from 1 to 6, which the Ruler cannot receive for want of Length. This is commonly called, *The Scale of Board-Meaſure.*

III. Another unequal Scale ſet in any place of the Ruler, Numbred from 1 to 10, and ſo forwards to 100, and Subdivided decimally as quantity will allow. And from the Numbering of it, it is here called, *The Scale of* 100.

IV. Two Scales ſet cloſe together edge to edge in any ſpare place of the Ruler. One of them is equally Divided, the other unequally.

V. That which is equally divided doth take up the juſt whole length of the Ruler, and is numbred up to 48, each part being half an Inch, anſwering to the half Inches upon the Ruler. That which is unequally divided goes up to 50. And according to theſe Numbers they are nominated; One, *The Scale of* 48: the other, *The Scale of* 50. They are Subdivided alſo decimally.

The Scale of Board-meaſure begins at 6, and for that cauſe muſt be numbred down to 60, that ſo it may contain a juſt Decad of Numbers, and thereby made fit to Meaſure a very great, or a very ſmall quantity.

A Very great quantity, that exceeds 60, and yet is to be counted upon the Scale of *Board-Meaſure*, muſt be divided by 10 or 100 [ſo for 70 you muſt take 7, for 125 take 12 $\frac{1}{2}$, *&c.* of the reſt] and that Number ſo divided, muſt be counted upon the Scale; which term of accompt will give a length: and this length muſt be Multiplied again by 10 or 100, and then the Product will give the length of a Foot, *&c.*

A very ſmall quantity, that falls under the number 6, and yet is to be counted upon the Scale of *Board-meaſure*, muſt be Multiplied by 10 or 100 [ſo for 4 you muſt take 40, or for 1 you muſt take 10, or for $\frac{3}{10}$ you muſt take $\frac{30}{10}$, that is 3, *&c*] and that Number ſo Multiplied, muſt be counted upon the Scale; and at the term of it, you ſhall have a length. This length muſt then be Divided by 10 or 100, and the Quotient will give the length of a Foot, *&c.* And if in ſmall things you would know how many Solid Inches are contained in the content of Solid Foot-Meaſure found out the former way; Say, As 1 to 1728, ſo the content

in Foot-Meaſure to the content in Solid Inches.

The principal uſes of theſe Scales are laid down in the Precepts that follow.

There are two wayes of Meaſuring commonly uſed. One is, to find the content of the whole immediatly. The other is, to find the Length of a Foot firſt, and afterwards by help of it to Meaſure how many Feet are contained in the whole. This latter, becauſe it is moſt in uſe, and beſt known, I intend to follow in theſe Precepts.

I. *To Meaſure Squared Board, or ſuch as is of the ſame Breadth.*

FIrſt Meaſure the Breadth of the Board by the Scale of Decimal Inches. Then count that Breadth upon the Scale of Board meaſure; So ſhall the diſtance from that Number, to the end of the Ruler next to 60, give the Length of One Foot. This Length, either upon the Ruler it ſelf, or taken from thence in a pair of Compaſſes, if it be turned as oft as may be upon the Board, will ſhew how many Square Feet are therein contained. And each one of theſe Lengths is a true Superficial Foot, by which any Number of Feet may be cut off from the Board,

II. *To Measure Tapering Board, or such as is of more Breadth at one end, than it is at the other.*

MEasure the Breadth of both ends with the Scale of Decimal Inches, add them together, and take half the Sum; which half Sum is the Mean Breadth between the two former. Supposing then this Mean Breadth to be the true Breadth, count it (as you did before) upon the Scale of Board-measure; For, the distance from thence to the end of the Ruler nearest 60, gives the Length of such a Foot as will Measure the Content of the whole. If therefore you take the Length, and Measure it, as oft as you can upon this Length of the Board, (which Length is Measured by the Line drawn quite along the midst of it) look how many times it is thereon contained, so many Square Feet doth the whole Board contain.

But then it must noted, that each of these Lengths is not a true Superficial Foot, for at the broader end of the Board, it is more, at the narrower end, it is less: and therefore what was before said of cutting off any number of Feet in Board all of an equal Breadth, will not hold true in Tapering Board. Now how this should be done, shall be shewed in another place, for it is too hard for common Measuring.

III. *To Measure Squared Solids, such as are Rectangular, and quite through of the same bigness.*

THe Bases of all Solids here measured, must be supposed to Perpendicular to the Axis in Cones and Pyramids, or to the Plains and sides of Parallelepipids, and all other Prismes.

Squared Solids are Rectangled Parallelepipids. To find the Content of these; you must first measure the Breadth and Depth of the Base, with your Scale of Decimal Inches. Then (upon the Line of 100) from 12 extend your Compasses to the Breadth, the same extent shall reach from the Depth to a Fourth Number: which being counted in the Scale of Broad-measure, will shew the Length of one Solid Foot; The Length (I say) of one Solid Foot will be, from that Fourth Number to that end of the Ruler which is next 60. This length being Measured as oft as it can be upon the Timber, will give the Number of the Solid Feet therein contained. And each one of these Lengths is a true Solid Foot, whereby any number of Feet may be cut off from the Timber.

If it fall out that the Fourth Number be too great to be counted upon the Scale of Broad-measure, then count $\frac{1}{10}$ part of it only, upon the same

ſame Scale, and referring it to the Line of Inches, it will ſhew the Length of 10 Feet; therefore $\frac{1}{10}$ part of that Length, is the Length of one Foot. Or again, if it happen that the Fourth Number be too ſmall to come upon the Scale of Board-meaſure, then count ten times that number upon the ſame Scale, and look what Inches do anſwer to it, the ſame Multiplied by 10, will give the Length of one Foot. And theſe two Cautions muſt be obſerved in the like Caſes, when they ſhall happen in the Precepts following.

IV. *To Meaſure ſuch Parallelepipid Solids as are faſhioned at their Baſes like Rhombs or Rhomboids.*

THe Baſes of the former Solids were Rectangular Parallelograms; but the Baſes of the Solids her mentioned are either Rhombs or Rhomboids; the reſt of the Plains going quite through the Length, as ſuppoſed to be Rectangular Parallelograms, as the former alſo were. Now to meaſure theſe; you muſt firſt (with your Scale of Decimal Inches) take the Breadth of the Baſe; And Secondly, you muſt (by the ſame Scale) Meaſure the Perpendicular Depth of the Solid, or that Line which falls Perpendicular to both the upper and lower Lines of the Baſe; and

this you must call the Depth of the Base. When this is done, the rest of the work is directly the same as it was before; For upon the Line of 100 you are to number this Breadth and Depth; and if you extend your Compasses from 12 to the Breadth, the same extent shall reach from the Depth to a Fourth Number. This Fourth Number must be counted upon the Scale of Board-measure; for from that Number, taken in that Scale to the end of the Ruler towards 60, gives the Length of one Solid Foot. And this Length being Measured as often as it may upon the Timber, shews the Solid Content of the same. And here also each one of these Lengths is an intire Solid Foot: so that any number of Feet may thereby be cut off from the Timber.

To Measure Squared Tapering Solids.

Such Tapering Solids are here meant only, as do either end in a Point, or else (though they be cut off) such as being continued would end in a Point as Pyramids do. That is to say, Here is shewed a way how to Measure either intire Pyramids, or else Resected Pyramids, whose Bases are either Rectangular Parallelograms, or Oblique angled Parallelograms, such as Rhombs or Rhomboids before mentioned.

V. *To Meaſure Timber of a Pyramidal Form.*

FIrſt, by the Scale of Decimal Inches, Meaſure the Breadth of the Baſe and the Depth of it likewiſe, as is declared before in the third and fourth Precepts. Then upon the Line of 100 count this Breadth and Depth: and extend your Compaſſes from 36 upon that Line to the Breadth, the ſame extent will reach from the Depth to a Fourth Number. Count this Fourth Number upon the Scale of Board meaſure; for from thence to the end of the Ruler towards 60, gives a Length. This Length Meaſured as oft as you can upon the Pyramid's Length (which is the *Axis* from the middle Point of the Baſe to the vertical Point of the Pyramid.) gives the number of Solid Feet contained in the whole. And here alſo (as before in Tapering Board) one of theſe Lengths at the great end is more than a juſt Solid Foot, and at the leaſt end it is leſs. And how to cut off a juſt Solid Foot, will be a work too hard to be ſhewed to common Meaſurers. It muſt therefore be omitted, as alſo in all the Tapering Solids that follow.

VI. *To Meaſure Tapering Timber of a Reſected Pyramidal Form.*

THe firſt work will be to Meaſure the Breadth and Depth of the greater Baſe, by the Scale of Decimal Inches, as is before declared. Then extend your Compaſſes from 36 (upon the Line of 100) to the Breadth counted upon the ſame Line, the ſame extent will reach from the Breadth to a 4th Number. Then Meaſure both the Breadths, (or both the Depths, which you will, for they are proportional one to the other) in the greater and leſſer Baſes with Decimal Inches, and count their quantities upon the Line of a 100, and take the diſtance of them with your Compaſſes. For this diſtance ſhall reach (upon the ſame Line of 100) from the precedent 4th Number (downward toward the beginning of the Line) to a 5th, and from the 5th to a 6th. Add theſe three, namely, the 4th, 5th and 6th Numbers together. The Sum of them count upon the Scale of Board-meaſure; for from thence to the end of the Ruler which is next 60, gives a Length. This Length turned upon the Timbers Length (which is to be eſteemed by the Axis thereof, or right Line paſſing through the two Centres of the two Baſes) as oft as it may, will give the Number of Solid Feet contained in the whole Reſected Tapering Timber.

VII. *How*

VII. *How to Meaſure Timber of a Pyramidal Form, whoſe Baſe is Triangular.*

IT matters not whether the Baſe be a Triangle Ordinate (of equal Side and Angles) or Inordinate, (each Side differing one from another:) for the work in them all is generally one, thus namely. Count any ſide of the Triangle as the Baſe thereof, and the Angle oppoſed thereto, is to be called the Vertical Angle. Then Meaſure the Baſe, and the Perpendicular falling thereon from the Vertical Angle, both with the Line of Decimal Inches. This done, extend your Compaſſes from 72 (upon the Line of 100) to the Baſe counted thereon, the ſame extent ſhall reach from the length of the Perpendicular to a 4th Number. Count this 4th Number upon the Scale of Board-meaſure, and ſo proceed as in the 5th Precept.

VIII. *How to Meaſure Tapering Timber of a Rejected Pyramidal form, whoſe two Baſes are of a Triangular form.*

THe Baſes may be of any Triangular form, whether ordinate or inordinate, as in the former Precept was intimated: only it is requiſite, that

that the two Baſes be like each other, that is, Equiangled and of proportional ſides, as that muſt of neceſſity be if the Timber be part of a Cone, ſuch as this Propoſition ſuppoſeth it to be.

Meaſure the Baſe of the Triangle at the greater end, and the Perpendicular falling thereon, with the Scale of Decimal Inches, as was ſhewed in the laſt precedent Precept. Then upon the Line of 100) extend your Compaſſes from 72, to the Length of the Baſe (counted upon the ſame Scale) the ſame extent will reach from the Perpendicular to a fourth Number. Then Meaſure any two like ſides (of the two Baſes of the Timber) with the Scale of Decimal Inches, and count the Numbers of them upon the Line of 100, and take the diſtance of them in your Compaſſes. This diſtance will reach from the Fourth Number downwards to a Fifth, and from that Fifth to a Sixth. Add theſe Fourth, Fifth and Sixth Numbers all into one Sum, this Sum counted, upon the Scale of Board-meaſure, gives a Length from that end of the Ruler which is neareſt to 60. And this Length turned upon the Length of the Timber as oft as it may, gives the number of Solid Feet contained in the whole Reſected Timber.

IX. *How*

IX. *How to Measure a Pyramid, whose Base is of a Multangular Ordinate Figure.*

ORdinate plain Figures, are such as are Equiangled and Equilateral. Pyramids of an Ordinate Triangular form may be Measured by the Seventh general Precept, for Triangular Bases: and those Pyramides that have Ordinate Quadrangular Bases (that is, true Square Bases) may be Measured by the third general Precept for Rectangular Solids. This Ninth Precept shews how to do the same work in Pyramids of Multangled and Ordinate Bases.

And note here in general, for this and all the Precepts that follow concerning Multangled Ordinate Bases, that the Radius *of the Base is a right Line drawn from the Centre of the Base, and falling Perpendicularly to one of the sides of the Polygon, and not the Line from the Centre to any of the Angles of the Base.* Then to go forward,

Measure the *Radius* of the Base, and the whole Perimeter thereof also, which may be done by a Line put round about it, and then Measuring that Line afterwards upon the Scale of Decimal Inches. Which done, extend your Compasses from 72 (upon the Scale 100) to the Perimeter counted

counted thereon; the ſame extent will reach from the Perpendicular or *Radius* to a 4th Number. Count this 4th Number, *&c.* as in the 5th. Precept.

X. *How to Meaſure Reſected Pyramids, whoſe two Baſes are of Multangled Ordinate Forms.*

MEaſure the *Radius*, and whole Perimeter of the greater Baſe, as before. And extend your Compaſſes from 72, to the Perimeter, the ſame extent will reach from the *Radius*, (counted as the former were, upon the ſame Scale of 100) to a 4th Number. Then again Meaſure (by your Scale of Decimal Inches) any two Lines upon the two Baſes (as the two Radiuſes. or the two Sides, or the two Perimeters, or any like Diagonals,) and count the Numbers of them upon the Scale of 100, and take their diſtance; for this diſtance will reach from the 4th Number (counted upon the Scale of a 100) downwards to a 5th, and from thence to a 6th. Add theſe three Numbers, the 4th, 5th and 6th together, and count their Sum upon the Scale of Broad-meaſure, *&c.* as before was ſhewed in the 6th Precept.

XI. *How*

XI. *How to Meaſure Priſmes, whoſe Baſes are of any Triangular Form, and both congruous to each other.*

WIth your Scale of Decimal Inches, Meaſure the Perpendicular and Baſe of the Triangular Baſe, as before in the 7th and 8th Precepts. Then count (upon the Line of 100) the Baſe; and extend your Compaſſes from 24 (upon the ſame Line) to the Baſe, the ſame extent will reach from the Perpendicular, to a 4th Number, which being counted in the Scale of Board-meaſure, *&c.* as in the third Precept. And each of theſe Lengths is a true Solid Foot, whereby, *&c.* as in the third Precept.

XII. *How to Meaſure Priſmes, whoſe Baſes are of any Ordinate Multangled Figure.*

THoſe Priſmes that are here Meaſured, are ſuch Solids as are of equal and congruous Baſes at both ends, and all the other Plains going along the whole length of ſuch Solids, are Rectangled Parallelograms.

If the Priſme to be Meaſured be of a Quadrangular Ordinate Baſe, (that is of a juſt Square Baſe) then it may be Meaſured by the third Precept,

cept, which is general for all Baſes of a Parallelogram Form, and ſo conſequently alſo of the Square or Ordinate Parallelogram Figure.

But if the Baſe be of a Multangled Ordinate Figure; you muſt firſt Meaſure the *Radius* and Perimeter thereof, by the Scale of Decimal Inches. Then counting the *Radius* and Perimeter upon the Line of 100; extend your Compaſſes from 24 to the Baſe, the ſame extent will reach from the Perimeter to a 4th Number. [Or extend your Compaſſes from 24 to the Perimeter, the ſame extent will reach from the Baſe to the ſame 4th Number.] Count this 4th Number upon the Scale of Board-meaſure, ſo ſhall the Length (from thence to the end of the Ruler next 60) give the length of one Foot Solid. Meaſure therefore this length upon the Solid Timber as oft as you can, for the Number of thoſe Lengths ſheweth the number of Solid Feet contained in the whole. And each one of theſe Lengths is a juſt Solid Foot, whereby any number of Feet may be cut off.

The Meaſuring of ſuch Solids whoſe Baſes are Circular; as Cylinders, Cones, Barrels, and ſuch like.

XIII. *To find the number of Solid Feet contained in a Cylinder.*

IN the Precepts that follow, the two Scales whoſe edges lie cloſe together, are to be uſed. Firſt, Meaſure the Diameter of one of the Cylinder's Baſes, by the Scale of Decimal Inches. Then count the Length thereof upon the equal Scale of 48, and over againſt it (in the annexed unequal Scale) you ſhall find another Number. Let this other Number be reſerved. Then upon the Line of 100, extend your Compaſſes from 12, to 36, the ſame extent ſhall reach from the reſerved Number (counted upon the ſame Line of 100) to a Fourth Number. Count the Fourth Number upon the Scale of Board-meaſure; for from that Number, to the end of the Ruler towards 60, gives the length of one Solid Foot. And this Length turned upon the Length of the Cylinder, ſhews the Number of Solid Feet contained in the whole Cylinder. And here alſo each one of theſe Lengths is a juſt Solid Foot, whereby any Number of Solid Feet may be cut off.

XIV. *To find the Solid Content of a Cone.*

MEaſure the Diameter of the Baſe by your Scale of Decimal Inches. Count that Length upon the Scale of 48, and ſee what Number in the Scale of 50 ſtands over againſt it. Count this Number upon the Scale of Board-Meaſure, ſo ſhall you find a Length, which being turned (in the manner that hath been often mentioned) upon the Cones Length, gives the Content of the whole Cone.

XV. *To find the Solid Content of a Reſected Cone.*

FIrſt, Meaſure the Diameter of the greater Baſe, by the Scale of Decimal Inches; and count the Number thereof upon the Scale of 48; over againſt which you ſhall ſee another Number in the Scale of 50, which muſt be reſerved. Then again, take the Length of the Diameter of the leſſer Baſe in Decimal Inchs. Count the Lengths of the two Diameters ſo meaſured, upon the Scale of 100, and take their diſtance with your Compaſſes. Then keeping this extent, count the Reſerved Number upon the Scale of 100, and extend the Compaſſes from that Number downward to a ſecond leſſer number, and from that

ſecond

ſecond to a third ſtill leſs. Add this firſt, ſecond, and third Numbers together, and count the Sum of them upon the Line of Board-Meaſure, where you ſhall find that length which will Meaſure the Content of Solid Feet in the whole, in ſuch manner as hath been often ſhewed before.

XVI. *Of Ganging Veſſels.*

WE have now done with the Scale of Board-Meaſure, which hath been of good uſe in all the 15 Propoſitions going before. In this Propoſition of *Ganging*, all the Menſurations muſt ſtill be made by by a Scale of Inches Decimally divided. But becauſe the Ruler is not of Length enough to Meaſure the Diameters and Lengths of Veſſels, eſpecially to Meaſure that Diameter which is at the Bung; nor is it convenient that it ſhould be ſoiled with any thing, (which it muſt be, if it be put into any full Veſſel,) it will therefore be moſt expedient, that a ſmall Staff be made fit to undergo ſuch ſervile uſes; and for that purpoſe may be of 4 or 5 Feet in Length, divided into Inches, and each Inch ſubdivided into 10 parts, as the Scale of Decimal Inches is upon the Ruler. They are to be numbered (not by Feet but) outright by 1,2,3,4,5, &c. to 48 or 60. It may be alſo furniſhed with convenient appurtenances for the more expedite and dexterous Menſuration of

the Length and Diameters of any Veſſel, as every Man ſhall beſt contrive for his own ſatisfaction.

1. With this Staff Meaſure the Inner Diameters at the Head and Bong; and the inner length of the Veſſel. For the Diameter at the Bong, the Staff is to be put into the Veſſel at the Bong-hole. The Diameter at the Head may be Meaſured on the outſide, allowing ſomewhat more than the very outer Diameter, becauſe of the Arching of the Veſſel. The length may be Meaſured on the outſide alſo from Head to Head, allowing for the thickneſs of the two Heads what ſhall be competent. If any think other ways better, they may uſe them.

2. Count the number of Inches in the Diameter of the Bong, upon the equal Scale of 48 upon your Ruler; and note in the Scale of 50, what number ſtands againſt it. Write down this number twice, one right under the other. And again, count the number of Inches in the Diameter at the Head upon the ſame Scale of 48, and look in the Scale of 50 what number ſtands even along with it. Write this number juſt under the two former. Then add all three numbers together keeping the Sum.

3. Upon the Line of 100 extend your Compaſſes from 19 25 to the length of the Veſſel, the ſame extent will reach from the Sum before kept, to the number of Wine-Gallons contained in the Veſſel. Or if you extend your Compaſſes from

22 69 to the length of the Veſſel 24, it muſt be; If 288 Solid Inches go to one Ale-Gallon, as is found at the Exciſe-Office, the ſame extent will reach from the Sum before kept, to the number of Ale-Gallons contained in the Veſſel.

For Example.

The Diam. at the Bong 36 Inches, counted in the Scale of 48, ſhews in the Scale of 50 — 28.30

28.30

The Diam. at the Head 30 Inches, counted in the Scale of 48, ſhews in the Scale of 50 — 19.64

The Sum of all three — 76.24

The Length of the Veſſel ſuppoſe to be 4 Foot, or 48 Inches.

Then work upon the Line of 100 thus. As 19 25 is to 48 the length: ſo 76 24 the Sum, to 190 the number of Wine-Gallons in the Veſſel.

And as 24 is to 22 69 is to 48, ſo 76 24 to 152 48/100 161, the number of Ale-Gallons in the ſame Veſſel.

This is done upon the Ruler. And if the Calculation had been made in greateſt exactneſs by numbers, the Wine-Gallons would have been 198 95, and the Ale-Gallons 152 36/100 161 7/10 no conſiderable difference.

Note that 190 and 151 1/2 161 being greater numbers than the Scale (which goeth but to 100) containeth, are counted upon the lower part of the Scale, where 7 is for theſe kinds of numbers

called 70; 8 is called 80; 10 for 100; 16 for 160; 19 for 190; 20 for 200; and ſo all the reſt ſutably.

This way of Menſuration ſuppoſeth a Barrel to be a part of a Spheroid, the two ends equally cut off, which having the moſt probable ground muſt perform therefore moſt true.

But if any deſire to go by the uſual way of a Mean Diameter, I will for their ſatisfaction ſet it down here alſo.

HAving then the two Diameters at the Head and Bong, take their difference; and (upon the Line of 100) extend your Compaſſes from 10 to 7, the ſame extent ſhall reach from that difference (counted upon the ſame Line of 100) to a 4th Number; which 4th Number, if it be added to the Diameter at the Head, it will make the Mean-Diameter required. This Mean Diameter thus found, muſt be counted upon the Scale of 48, and in the Scale of 50 over againſt your Mean Diameter, you ſhall find a Number which is to be reſerved. Then go again to your Line of 100, and ſay, as $6\frac{42}{100}$ is to the reſerved Number; ſo is the Length to the number of Wine-Gallons in the Veſſel. And as $\frac{8}{7}$ 56 is to the reſerved Number, ſo is the Length to the number

number of Ale Gallons, This work (in the former Example) will find the Mean Diameter to be 34 $\frac{2}{10}$; and the reſerved Number alſo 25 $\frac{1}{2}$ the Content of the Veſſel in Wine Gallons 191 almoſt; the Content of the ſame Veſſel in Ale Gallons, almoſt 162, 153, if 288 Solid Inches go to the making of the Gallon. Theſe do ſomewhat differ from the former; yet in regard of the inequality of the inſide of the Veſſel, and the uncertainty of the Veſſels true Figure, they may be near enough to truth. *So much of Ganging.*

How to Meaſure Cartridges of Powder, to know how many Pounds are contained in them.

XVII. *And firſt, if the Cartridge be of a Cylindrical Figure.*

APply the Line of 50 to the Diameter of the Cylinder, and ſee what number of thoſe unequal parts it reacheth unto. Then Meaſure the length of the Cylinder by the Scale of Decimal Inches. Afterwards upon the Line of 100 work thus; Extend your Compaſſes from 3 $\frac{71}{100}$ to the number of the Diameter before found by the Scale of 50; the ſame extent will reach from the number of the Cylinder's length, to the num-

ber of the Pounds of Gun-powder therein contained.

XVIII. *Secondly, if the Cartridge be in form of a Reſected Cone.*

APply the Line of 50 to the greater Baſes Diameter, and note what number it reacheth unto. Then Meaſure the two Diameters of the two Baſes by the Scale of Decimal Inches. After, upon the Line of 100, count theſe two Diameters, and take the diſtance of them with your Compaſſes. Then ſetting one Foot of that extent upon the firſt number (taking out of the Line of 50, and counted now upon the Line of 100) which will reach (downwards towards the beginning of the Line at 1) to a ſecond number, and from that ſecond (ſtill downwards) to a third. Add theſe firſt, ſecond and third numbers together into one Sum, and Meaſure the length of the Reſected Cone by the Scale of Decimal Inches. Then again (upon the Line of 100) extend your Compaſſes from 11 $\frac{13}{100}$ to the forenamed length, the ſame extent ſhall reach from the Sum of the three number before found, to the number of Pounds of Gun-powder contained in the Reſected Cone.

Or thus you may do. Apply the Line of 50 to the

the Diameters of both Baſes, and note the numbers, and count them upon the Line of 100, and divide the diſtance of them upon that Line into two equal parts, and note the middle number upon which the Compaſs Foot falls. Then add theſe three numbers (the two extremes and the middle one now found) into one Sum, and Meaſure the length of the Reſected Cone by the Scale of Decimal Inches. Then again, *&c.* as in the former way.

XIX. *Thirdly, If the Cartridge ſhould be in form of a perfect Cone.*

APply the Line of 50 to the Diameter of the Baſe, and note what number it extendeth unto. Then meaſure the length of the Cone by the Scale of Decimal Inches. After this, (upon the Line of 100) extend your Compaſſes from $11\frac{13}{100}$ to the length of the Cone; the ſame extent will reach from the firſt noted number (of the Diameter of the Baſe) to the number of Pounds of *Gunpowder* contained in the Cone.

Theſe Scales may be applied to divers other like uſes; but for the preſent let theſe Propoſitions ſuffice.

S. F.

March 9: $164\frac{3}{4}$.

Other

Other Precepts for the Menſuration of *PLAINS* and *SOLIDS*.

SECT. I.

Of Plain Meaſure taken with a Foot, Yard, or Chain, divided into Decimal parts.

BOARD and GLASS are commonly Meaſured by the Foot. wherefore, if a board be Meaſured with a Foot-meaſure divided into 100 equal parts, and (B) the Breadth Multiplied by (L) the Length; the Product will ſhew (C) the Content in Feet and Decimal parts of a Foot.

1. *Example.*

A Board is Feet, 1.25 Broad, and Feet 13.45 Long. How many Foot doth it contain in all?

Multiply 13.45 by 1.25, the Product will be Feet, 16.8125, the Content of that Board in Feet, and Decimal parts.

For { 1 . B :: , L . C .
{ 1 . 1.25 :: 13.45 16.8125 .

2. *Example.*

A Paine of Glaſs being Feet 8.887 Broad, and Feet 0.92 Long, what is the whole Content?

Say, { 1 B :: L . C
{ 1 0.87 :: 8.92 . 0.8004 .

Paving

Paving, *Plaiſtering*, *Painting*, and *Wainſcot*, is commonly Meaſured by the Yard, every Square Yard containing 9 Square Feet. Wherefore if a Piece of *Paving*, *&c.* be Meaſured with a Yard, divided into 1000 equal parts, and (B) the Breadth, Multiply by (L) the Length the Product will ſhew (C) the Content in Yards and Decimal parts.

Example.

A piece of *Paving* being Yards 3.5 Broad, and Yards 17.75 Long; how much is the Content?

Multiply 17.75 by 3.5, the Product will be Yards 62.125, the Content of that *Pavement* in Yards and Decimal parts.

1 . B :: L . C
1 . 3.5 :: 17.75 . 62.125, the Content.

But if the ſame *Pavement* had been Meaſured with a Foot divided into a 100 equal parts, the Breadth would have been found to be Feet 10.5, and the Length Feet 53.25; which Multiply together, the Product would ſhew Feet 559.125 for the Content in Feet; which being divided by 9, the Quotient will be Yards 62.125, the Content in Yards and Decimal parts, according with the former example.

A Parallelogram or four-ſided Rectangle Superficies being given, to find the length of a Superficial Foot.

Take

Take with your Ruler the breadth thereof in in Feet, and Decimals of a Foot: and by the breadth ſo taken, divide 1. the Quotient ſhall be the length of a Superficial Foot.

Example.

A Board is Feet 1.25 broad, how much thereof will make a Foot?

Divide 1 Foot by B 1.25, the Quotient will be 0.8 for L the length of a Foot. Likewiſe, if the breadth be meaſured with a Yard, divide 1 Yard by the breadth, the Quotient will ſhew the length of 1 Yard.

Tiling, *Slating*, and *Flooring* is commonly reckoned by the *Square*, which is 10 Foot every way, in all 100 Foot.

Example. There is a Roof, Feet 16.25 broad, and Feet 95.2 long; How many *Squares* is contained therein?

Multiply the length B×L by the breadth, the Product will be Feet 1547, which number being divided by 100, the Quotient will be *Squares* 15.47 the Content required to be known, that is $\frac{BL}{100}$ = *Area* in *Squares*.

Or if you deſire to know the length of a Square, divide 100 by the Breadth, the Quotient will be Feet 6.154 — almoſt; ſo much ſhall be the length of one Square of that breadth; that is $\frac{100}{B}$ = the length of a Square.

SECT. II.

SECT. II.

Of Solid Meaſure taken with a Foot divided into 100 *equal parts.*

HAving (S) the ſide of a Square, equal to √B A the Baſe of a Solid, and L the length thereof given in Foot-meaſure; to find (C) the Content thereof in Feet. Say,

1 . S :: L . Q :: Q . C
1 . √BA :: L . Q :: Q . C

That is, Multiply the ſide given by the length; and again, Multiply that Product by it ſelf, and then divide that laſt Product by the length, the Quotient will ſhew the Content in Feet, and Decimal Parts.

Example.

Suppoſe a Square Solid whereof the ſide is Feet 2.25, and the length Feet 20.33, I require the Content.

Multiply (L) 20.3 by (S) 2.25, the Product will be (Q) 45.675. Again, 45.675 Multiplied by 45.675, the Product will be 2082.464025, which divided by L 20.3, the Quotient will be Feet 10584434^{x} the (C) Content ſought.

Having

Having the (S) ſide of a Square equal to (B A) the Baſe of a Solid given in Foot-meaſure. To find the Length of a Foot Solid in Foot-meaſure. Say,

S . 1 :: 1 . Q :: Q . the Length of 1 Foot.

That is Divide 1 . by (S) the ſide of the Square given, and Multiply the Quotient by it ſelf; the Product will ſhew the Length of a Solid Foot.

Example.

Suppoſe (S) the ſide of a Square equal to (B A) the Baſe of a Solid be Feet 2.25; I demand how much in Length will make a Solid Foot.

Divide 1.000 by 2.25, the Quotient will be 04444, the Length of a Foot Solid.

Having (B) the Breadth, and (D) the Depth of a Squared Solid given in Foot-meaſure; to find the Length of a Foot Solid in Foot-meaſure. Say,

1 . B :: D . B A :: Again B A . 1 :: 1 . the Length of 1 Foot.

Having (L) the Length, (B) the Breadth, and (D) the Depth of a Squared Solid given in Foot-meaſure; to find (C) the Content in Feet. Say,

1 . B :: D . B A . Again ſay, 1 . B A :: L . C . the Content.

Firſt, Multiply (B) the Breadth by (D) the Depth, the Product will be (B A) the *Area* of the Baſe. Again, (B A) Multiplied by (L) the Length; the Product will be (C) the Content of that Solid in Foot-meaſure.

It is the common practice of moſt Carpenters, and

and others which uſe to Meaſure Tapering Timber, to Meaſure the Breadth and Depth thereof in the very middle, which they Multiply into each other, and take the Section there for the Baſe of a Square Solid equal to the Tapering piece; and Multiplying that Baſe ſo found, by the Length of the Solid given; they take that Product for the Solid Content of that piece ſo by them Meaſured. Which manner of Meaſuring of Tapering Timber (though it be falſe, and ever giveth the Content leſs than ought to be;) yet Cuſtom, and Eaſe are ſo prevalent with moſt, that they rather chooſe to follow an old Error, than to learn the Truth. But for thoſe who are more Ingenious, and lovers of Truth, they may uſe this Rule enſuing, which is the true way to Meaſure ſuch kind of Timber.

Find out the Baſes at both ends, and Multiply the one by the other, and out of the Product thereof, extract the Square-Root, then add together both the Baſes, and that Square-Root, and Multiply the aggregate thereof by one third part of the Length; the Product will be the Content.

Example.

There is a Tapering piece of Timber, the length whereof is Feet 16.8, and the breadth of the Baſe at the greater end, is Feet 1.84, and the thickneſs thereof is Feet 1.38, which Multiplied together, the Product will be Feet 2.5392, for the greater Baſe: the breadth of the Baſe at the leſſer end,

is

is Feet 1.25, and the thickneſs or depth thereof is Feet 0.92, which Multiplied together, the Product will be Feet 1.15 for the leſſer Baſe; Multiply the Baſes together, the Product will be 2.92008, the Square Root whereof is 1.7058x; to which if you Add the Sums of both the Baſes, the Aggregate will be 5.595, which being Multiplied by $\frac{1}{7}$ of the length, *ſcil.* 5.6, the Product will be Feet 30212, the Content of that piece of Timber.

Some other having taken the breadth at both ends; Add them together, and take half that Sum for the breadth in the middle; and likewiſe they find the depth in the ſame manner: then they Multiply the depth and breadth together; And laſtly, that Product Multiplied by the length, then they take that laſt Product for the Content; which manner of Meaſuring will produce the ſame Errour, as the other taken by the middle Section.

There are many other wayes of Meaſuring, but the following Table performeth all manner of Menſurations with great eaſe, delight, and exactneſs, and exceedeth all others, that of the Pen only excepted.

The Table follows.

A TABLE OF *PROPORTIONAL* OR *LOGARITMICAL* NUMBERS to 10000.

By which

Multiplication, *Diviſion*, the *Rule* of *Proportion*, the *Extraction* of the *Square* and *Cube Roots*, are all of them performed by *Addition* and *Subſtraction* only:

And hereunto is added their farther Uſe, exemplified in all manner of *Menſurations*.

Num	Logarith.	Num	Logarith.	Num	Logarith.
1	0.000000	36	1.556302	71	1.851258
2	0.301030	37	1.568202	72	1.857332
3	0.477121	38	1.579783	73	1.863323
4	0.602060	39	1.591064	74	1.869232
5	0.698970	40	1.602060	75	1.875061
6	0.776151	41	1.612783	76	1.880813
7	0.845098	42	1.623249	77	1.886499
8	0.903090	43	1.633468	78	1.892094
9	0.954242	44	1.643453	79	1.897627
10	1.000000	45	1.653212	80	1.903090
11	1.041392	46	1.662758	81	1.908485
12	1.079181	47	1.672098	82	1.913814
13	1.113943	48	1.681241	83	1.919078
14	1.146128	49	1.690196	84	1.924289
15	1.176091	50	1.698970	85	1.929418
16	1.204120	51	1.707570	86	1.934498
17	1.230459	52	1.716003	87	1.939519
18	1.255272	53	1.724276	88	1.944383
19	1.278753	54	1.732394	89	1.949390
20	1.301030	55	1.740362	90	1.954242
21	1.322219	56	1.748188	91	1.959041
22	1.342423	57	1.755874	92	1.963788
23	1.361728	58	1.763428	93	1.968482
24	1.380211	59	1.770852	94	1.973128
25	1.397940	60	1.778151	95	1.977723
26	1.414973	61	1.785330	96	1.982271
27	1.431364	62	1.792392	97	1.986772
28	1.447158	63	1.899340	98	1.991226
29	1.462398	64	1.806180	99	1.995635
30	1.477121	65	1.812913	100	2.000000
31	1.491362	66	1.819543	101	2.004321
32	1.505150	67	1.826074	102	2.008600
33	1.518514	68	1.832509	103	2.012837
34	1.531479	69	1.838849	104	2.017033
35	1.544068	70	1.845098	105	2.021189

Num	Logarith.	Num	Logarith.	Num	Logarith.
106	2.025306	141	2.149219	176	2.245522
107	2.029384	142	2.152288	177	2.247973
108	2.033424	143	2.155336	178	2.250420
109	2.037426	144	2.158362	179	2.252853
110	2.041393	145	2.161368	180	2.255272
111	2.045323	146	2.164352	181	2.257678
112	2.049218	147	2.167317	182	2.260071
113	2.053078	148	2.170261	183	2.262451
114	2.056905	149	2.173186	184	2.264817
115	2.060697	150	2.176091	185	2.267171
116	2.064458	151	2.178976	186	2.269512
117	2.068186	152	2.181843	187	2.271841
118	2.071882	153	2.184691	188	2.274157
119	2.075547	154	2.187520	189	2.276461
120	2.079181	155	2.190331	190	2.278753
121	1.082785	156	2.193124	191	2.281033
122	2.086369	157	2.195899	192	2.283301
123	2.089905	158	2.198657	193	2.285557
124	2.093422	159	2.201397	194	2.287801
125	2.096910	160	2.204120	195	2.290034
126	2.100370	161	2.206825	196	2.292256
127	2.103804	162	2.209515	197	2.294466
128	2.107280	163	2.212187	198	2.296665
129	2.110589	164	2.214843	199	2.298853
130	2.113943	165	2.217483	200	2.301030
131	2.117271	166	2.220108	201	2.303196
132	2.110574	167	2.222716	202	2.305351
133	2.123851	168	2.225309	203	2.307496
134	2.120105	169	2.227886	204	2.309630
135	2.130334	170	2.220448	205	2.311753
136	2.133539	271	2.232996	206	2.313867
137	2.136710	172	2.235528	207	2.315970
138	2.139876	173	2.238046	208	2.318063
139	2.143015	174	2.240549	209	2.320146
140	2.146128	175	2.243038	210	2.322219

Num	Logarith.	Num	Logarith.	Num	Logarith.
211	2. 324282	246	2. 390935	281	2. 448706
212	2. 326335	247	2. 392696	282	2. 450249
213	2. 328379	248	2. 394451	283	2. 451786
214	2. 330413	249	2. 396199	284	2. 453318
215	2. 332438	250	2. 397940	285	2. 454844
216	2. 334453	251	2. 399673	286	2. 456366
217	2. 336459	252	2. 401400	287	2. 457881
218	2. 338456	253	2. 403120	288	2. 459392
219	2. 340444	254	2. 404833	289	2. 460897
220	2. 342442	255	2. 406540	290	2. 462398
221	2. 344392	256	2. 408239	291	2. 463893
222	2. 346353	257	2. 409933	292	2. 465382
223	2. 348304	258	2. 411619	293	2. 466867
224	2. 350248	259	2. 413299	294	2. 468347
225	2. 352182	260	2. 414973	295	2. 469822
226	2. 354108	261	2. 416640	296	2. 471291
227	2. 356025	262	2. 418301	297	2. 472756
228	2. 357934	263	2. 429955	298	2. 474216
229	2. 359835	264	2. 421603	299	2. 475671
230	2. 361727	265	2. 423245	300	2. 477121
231	2. 363612	266	2. 424881	301	2. 478566
232	2. 365488	267	2. 426511	302	2. 480006
233	2. 367355	268	2. 428134	303	2. 481442
234	2. 369215	269	2. 429752	304	2. 482873
235	2. 371067	270	2. 431363	305	2. 484299
236	2. 372912	271	2. 432969	306	2. 485721
237	2. 374748	272	2. 434568	307	2. 487138
238	2. 376577	273	2. 436162	308	2. 488550
239	2. 378397	274	2. 437750	309	2. 489958
240	2. 380211	275	2. 439832	310	2. 491361
241	2. 382017	276	2. 440909	311	2. 492760
242	2. 383815	277	2. 442479	312	2. 494154
243	2. 385606	278	2. 444044	313	2. 495544
244	2. 387389	279	2. 445604	314	2. 496929
245	2. 389166	280	2. 447158	315	2. 498310

Num	Logairth.	Num	Logarith.	Num	Logarith.
316	2. 499687	351	2. 545307	386	2. 586587
317	2. 501059	352	2. 546543	387	2. 587711
318	2. 502427	353	2. 547774	388	2. 588831
319	2. 503790	354	2. 549003	389	2. 589949
320	2. 505150	355	2. 550228	390	2. 591064
321	2. 506505	356	2. 551450	391	2. 592176
322	2. 507855	357	2. 552668	392	2. 593286
323	2. 509202	358	2. 553883	393	2. 594362
324	2. 510545	359	2. 555094	394	2. 595496
325	2. 511883	360	2. 556302	395	2. 596597
326	2. 513217	361	2. 557507	396	2. 597695
327	2. 514547	362	2. 558708	397	2. 598790
328	2. 515873	363	2. 559906	398	2. 599882
329	2. 517195	364	2. 562101	399	2. 600973
330	2. 518513	365	2. 561292	400	2. 602060
331	2. 519828	366	2. 563481	401	2. 603144
332	2. 521138	367	2. 564666	402	2. 604226
333	2. 522444	368	2. 565847	403	2. 605305
334	2. 523746	369	2. 567026	404	2. 606381
335	2. 525044	370	2. 568201	405	2. 607455
336	2. 526339	371	2. 569373	406	2. 608526
337	2. 527629	372	2. 570542	407	2. 609594
338	2. 528916	373	2. 571708	408	2. 610660
339	2. 530199	374	2. 572871	409	2. 611723
340	2. 531478	375	2. 574031	410	2. 612783
341	2. 532754	376	2. 575187	411	2. 613841
342	2. 534026	377	2. 576341	412	2. 614897
343	2. 535298	378	2. 577491	413	2. 615950
344	2. 536554	379	2. 578639	414	2. 617000
345	2. 537819	380	2. 579783	415	2. 618048
346	2. 539076	381	2. 580925	416	2. 619093
347	2. 540329	382	2. 582062	417	2. 620136
348	2. 541579	383	2. 583198	418	2. 621176
349	2. 542825	384	2. 584331	419	2. 622214
350	2. 544068	385	2. 585440	420	2. 623249

Num	Logarith.	Num	Logarith.	Num	Logarith.
421	2. 624282	456	2. 658964	491	2. 691081
422	2. 625312	457	2. 659916	492	2. 691965
423	2. 626340	458	2. 660865	493	2. 692846
424	2. 627365	459	2. 661812	494	2. 693726
425	2. 628388	460	2. 662757	495	2. 694605
426	2. 629409	461	2. 663700	496	2. 695481
427	2. 630427	462	2. 664642	497	2. 696356
428	2. 631443	463	2. 665588	468	2. 697229
429	2. 632457	464	2. 666511	499	2. 698100
430	2. 633468	465	2. 667452	500	2. 698970
431	2. 634477	466	2. 668385	501	2. 699837
432	2. 635483	467	2. 669316	502	2. 700703
433	2. 636487	468	3. 670245	503	2. 701568
434	2. 637489	469	2. 671172	504	2. 702430
435	2. 638489	470	2. 672097	505	2. 703291
436	2. 639486	471	2. 673021	506	2. 704150
437	2. 640481	472	2. 673042	507	2. 705007
438	2. 641474	473	2. 674861	508	2. 705863
439	2. 642464	474	2. 675778	509	2. 706717
440	2. 643452	475	2. 676693	510	2. 707570
441	2. 644438	476	2. 677606	511	2. 708420
442	2. 645422	477	2. 678518	512	2. 709269
443	2. 646403	478	2. 679427	513	2. 710117
444	2. 647383	479	2. 680335	514	2. 710963
445	2. 648360	480	2. 681241	515	2. 711807
446	2. 649334	481	2. 682145	516	2. 716836
447	2. 650307	482	2. 683047	517	2. 717670
448	2. 651278	483	2. 683947	518	2. 718501
449	2. 652246	484	2. 684845	519	2. 719331
450	2. 653212	485	2. 685741	520	2. 710153
451	2. 654176	486	2. 686636	521	2. 716837
452	2. 655138	487	2. 687528	522	2. 717670
453	2. 656098	488	2. 688419	523	2. 718501
454	2. 657055	489	2. 689308	524	2. 719331
455	2. 658011	490	2. 690196	525	2. 720159

Num	Logarith.	Num	Logarith.	Num	Logairth.
526	2.720985	561	2.748962	596	2.775246
527	2.721810	562	2.749736	567	2.775974
528	2.722633	563	2.750508	598	2.776701
529	2.723455	564	2.751279	599	2.777427
530	2.724275	565	2.752048	600	2.778151
531	2.725094	566	2.752816	601	2.778874
532	2.725911	567	2.753583	602	2.779596
533	2.726727	568	2.754318	603	2.780317
534	2.727541	569	2.755142	604	2.781036
535	2.728353	570	2.755874	605	2.781755
536	2.739164	571	2.756636	606	2.782472
537	2.729974	572	2.757396	607	2.783183
538	2.730782	573	2.758154	608	2.783903
539	2.731588	574	2.758911	609	2.784617
540	2.732393	575	2.759667	610	2.785329
541	2.733197	576	2.760422	611	2.786041
542	2.733999	577	2.761175	612	2.786751
343	2.734799	578	2.761927	613	2.787460
544	2.735598	579	2.762678	614	2.788168
545	2.736396	680	2.763428	615	2.788875
546	2.737192	381	2.764176	616	2.789580
547	2.737987	382	2.764623	617	2.790285
548	2.738780	583	2.765668	618	2.790988
549	2.739572	584	2.766412	619	2.791690
550	2.740362	585	2.767155	620	2.792291
551	2.741151	586	2.567897	621	2.793091
552	2.741939	587	2.768638	622	2.793790
553	2.742725	588	2.769377	623	2.794488
554	2.743509	589	2.770115	624	2.795184
555	2.744293	590	2.770852	625	2.795880
556	2.745074	591	2.771587	626	2.799576
557	2.745855	592	2.772321	627	2.797267
558	2.746634	593	2.773054	628	2.797959
559	2.747411	594	2.773786	629	2.798646
560	2.748188	595	2.774516	630	2.799348

Num	Logarith.	Num	Logarith.	Num	Logarith.
631	2. 800029	666	2. 823474	701	2. 845718
632	2. 800717	667	2. 824125	702	2. 846337
633	2. 801403	668	2. 824776	703	2. 846955
634	2. 802089	669	2. 825426	704	2. 847572
635	2. 802773	670	2. 826074	705	2. 848180
636	2. 803457	671	2. 826722	706	2. 848804
637	2. 804139	672	2. 827369	707	2. 849419
638	2. 804820	673	2. 828015	708	2. 850033
639	2. 805500	674	2. 828659	709	2. 850246
640	2. 806180	675	2. 829203	710	2. 851658
641	2. 806858	676	2. 829946	711	2. 851669
642	2. 807535	677	2. 830588	712	2. 852480
643	2. 808211	678	2. 831229	713	2. 853089
644	2. 808885	679	2. 831869	714	2. 853698
645	2. 809559	680	2. 832508	715	2. 854206
646	2. 810232	681	2. 833147	716	2. 854913
647	2. 810904	682	2. 833784	717	2. 855519
648	2. 811575	683	2. 834420	718	2. 856124
649	2. 812244	684	2. 835056	719	2. 856728
650	2. 812913	685	2. 835690	720	2. 857332
651	2. 813581	676	2. 836324	721	2. 857935
652	2. 814247	687	2. 836956	722	2. 858537
653	2. 814613	688	2. 837588	723	2. 859138
654	2. 815577	689	2. 838219	724	2. 859738
655	2. 816241	690	2. 838849	725	2. 860338
656	2. 816903	691	2. 839478	726	2. 860936
657	2. 817565	692	2. 840106	727	2. 861534
658	2. 818225	693	2. 840733	728	2. 862131
659	2. 818885	694	2. 841359	729	2. 662727
660	2. 819543	695	2. 841984	730	2. 863322
661	2. 820201	696	2. 842009	731	2. 863917
662	2. 820858	697	2. 843232	732	2. 864511
663	2. 821513	698	2. 843855	733	2. 865104
664	2. 812168	699	2. 844477	734	2. 865696
665	2. 822821	700	2. 845098	735	2. 866287

Num	Logarith.	Num	Logarith.	Num	Logarith.
736	2. 866677	771	2. 887054	806	2. 906335
737	2. 867467	772	2. 887617	807	2. 906873
738	2. 868056	773	2. 888179	808	2. 907411
739	2. 868644	774	2. 888741	809	2. 907948
740	2. 869231	775	2. 889301	810	2. 908485
741	2. 869818	776	2. 889861	811	2. 909020
742	2. 870403	777	2. 890421	812	2. 909556
743	2. 870988	778	2. 890979	813	2. 910090
744	2. 871572	779	2. 891537	814	2. 910624
745	2. 872156	780	2. 892094	815	2. 911157
746	2. 872738	781	2. 892651	816	2. 911690
747	2. 873320	782	2. 893206	817	2. 912222
748	2. 873501	783	2. 893761	818	2. 912753
749	2. 874481	784	2. 894316	819	2. 913283
750	2. 875061	785	2. 894869	820	2. 913813
751	2. 875639	786	2. 895422	921	2. 914343
752	2. 876217	787	2. 895974	822	2. 914871
753	2. 876795	788	2. 896526	823	2. 915399
754	2. 877371	789	2. 897077	824	2. 915927
755	2. 877946	790	2. 897627	825	2. 926453
756	2. 878521	791	2. 898176	826	2. 916980
757	2. 879095	792	2. 898725	827	2. 917505
758	2. 879669	793	2. 899273	828	2. 918030
759	2. 880241	794	2. 899820	829	2. 918554
760	2. 880813	795	2. 900367	830	2. 919078
761	2. 881384	796	2. 900913	831	2. 929601
762	2. 831955	797	2. 901458	832	2. 920123
763	2. 882524	798	2. 902002	833	2. 920645
764	2. 883093	799	2. 902546	834	2. 921166
765	2. 883661	800	2. 903090	835	2. 921687
766	2. 884228	801	2. 903632	836	2. 922206
767	2. 884795	802	2. 904174	837	2. 922725
768	2. 885361	803	2. 904715	838	2. 923244
769	2. 885926	804	2. 905256	839	2. 923762
770	2. 886490	805	2. 905790	840	2. 924279

Num	Logarith.	Num	Logarith.	Num	Logarith.
841	2. 924796	876	2. 942504	911	2. 959518
842	2. 925312	877	2. 942999	912	2. 959994
843	2. 925827	878	2. 943494	913	2. 960470
844	2. 926342	879	2. 943988	914	2. 960946
845	2. 926856	880	2. 944482	915	2. 961421
846	2. 927370	881	2. 944975	916	2. 961895
847	2. 927883	882	2. 945468	917	2. 962369
848	2. 928395	883	2. 945960	918	2. 962842
849	2. 928907	884	2. 946452	919	2. 963315
850	2. 929418	885	2. 946943	920	2. 963787
851	2. 929929	886	2. 947433	921	2. 964259
852	2. 930439	887	2. 947923	922	2. 964730
853	2. 930949	888	2. 948413	923	2. 965209
854	2. 931457	889	2. 948901	624	2. 965672
855	2. 931966	890	2. 949390	925	2. 966141
856	2. 932473	891	2. 949877	926	2. 966611
857	2. 932980	892	2. 950364	927	2. 967079
858	2. 933487	893	2. 950851	928	2. 967548
859	2. 933993	894	2. 951337	929	2. 968010
860	2. 934498	895	2. 951823	930	2. 968482
861	2. 935003	896	2. 952308	931	2. 968949
862	2. 935507	897	2. 952792	932	2. 969415
863	2. 936010	898	2. 953276	933	2. 969881
864	2. 936513	899	2. 953759	934	2. 970347
865	2. 937016	900	2. 954242	935	2. 970811
866	2. 937517	901	2. 954724	936	2. 971275
867	2. 938019	002	2. 955206	937	2. 941739
868	2. 938119	903	2. 955687	938	2. 972205
869	2. 939019	904	2. 956158	939	2. 972665
870	2. 939519	905	2. 956648	940	2. 973127
871	2. 940018	906	2. 957128	941	2. 973589
872	2. 940516	907	2. 957607	942	2. 974050
873	2. 941014	908	2. 958085	943	2. 974511
874	2. 941511	909	2. 958563	944	2. 974972
875	2. 942008	910	2. 959041	945	2. 975431

Num	Logarith.	Num	Logarith.	Num	Logarith.
946	2. 975891	981	2. 991609	1016	3. 006393
947	2. 976350	982	2. 992111	1017	3. 007320
948	2. 976808	983	2. 992553	1018	3. 007747
949	2. 977266	984	2. 992995	1019	3. 008174
950	2. 977723	985	2. 993436	1020	3. 008600
951	2. 978180	986	2. 993976	1021	3. 009025
952	2. 978636	987	2. 994317	1022	3. 009450
953	2. 979092	988	2. 994156	1023	3. 009875
954	2. 979548	989	2. 995799	1024	3 010299
955	2. 980003	990	2. 995635	1025	3 010723
956	2. 980457	991	2. 966073	1026	3. 011147
957	2. 980911	992	2. 996511	1027	3. 011570
958	2. 981365	993	2. 996949	1028	3. 011993
959	2. 981818	994	2. 997386	1029	3. 012415
960	2. 982271	995	2. 997823	1030	3. 012837
961	2. 982723	996	2. 998259	1031	3. 013258
962	2. 983175	997	2. 998595	1032	3. 013679
963	2. 983626	998	2. 999320	1033	3. 014100
964	2. 984077	999	2. 999695	1034	3. 014520
965	2. 984527	1000	3 000000	1035	3. 014940
966	2. 984977	1001	3. 000434	1036	3. 015359
967	2. 985426	1002	3. 000867	1037	3. 015778
968	2. 985875	1003	3. 001300	1038	3. 016197
969	2. 986323	1004	3. 001733	1039	3. 016615
970	2. 986771	1005	3. 002166	1040	3. 017033
971	2. 987219	1006	3. 002598	1041	3. 017450
972	2. 987666	1007	3. 003049	1042	3. 017867
973	2. 988112	1008	3. 003460	1043	3. 018284
974	2. 988558	1009	3. 003890	1044	3. 018700
975	2. 989004	1010	3. 004321	1045	3. 019116
976	2. 989449	1011	3. 004751	1046	3. 019591
977	2. 989894	1012	3. 005180	1047	3. 019946
978	2. 990338	1013	3. 005609	1048	3. 020361
979	2. 990782	1014	3. 006037	1049	3. 020775
980	2. 991126	1015	3. 006466	1050	3. 021189

Num	Logarith.	Num	Logarith.	Num	Logarith.
1051	3.021602	1086	3.935829	1121	3.049605
1052	3.022015	1087	3.036229	1122	3.049992
1053	3.022728	1088	3.036628	1123	3.050379
1054	3.022840	1089	3.037027	1124	3.050766
1055	3.023252	1090	3.037246	1125	3.051152
1056	3.023663	1091	3.037824	1126	3.051538
1057	3.024075	1092	3.038222	1127	3.051923
1058	3.024485	1093	3.038620	1128	3.052309
1059	3.024896	1094	3.039017	1129	3.052693
1060	3.025305	1095	3.039414	1130	3.053078
1061	3.025715	1096	3.039810	1131	3.053462
1062	3.026124	1097	3.040206	1132	3.053846
1063	3.026533	1098	3.040602	1133	3.054229
1064	3.026941	1099	3.040997	1134	3.054613
1065	3.027349	1100	3.041392	1135	3.054995
1066	3.027757	1101	3.041787	1136	3.055378
1067	3.028164	1102	3.042181	1137	3.055760
1068	3.028571	1103	3.042575	1138	3.056142
1069	3.028977	1104	3.042969	1139	3.056523
1070	3.029383	1105	3.043362	1140	3.056904
1071	3.029789	1106	3.043755	1141	3.057285
1072	3.030194	1107	3.044147	1142	3.057666
1073	3.030509	1108	3.044539	1143	3.058046
1074	3.031004	1109	3.044931	1144	3.058426
1075	3.031408	1110	3.045323	1145	3.058805
1076	3.031812	1111	3.045714	1146	3.059184
1077	3.032215	1112	3.046104	1147	3.059563
1078	3.032618	1113	3.046495	1148	3.059941
1079	3.033021	1114	3.046885	1149	3.060320
1080	3.033423	1115	3.047274	1150	3.060697
1081	3.033825	1116	3.047664	1152	3.061075
1082	3.034227	1117	3.048053	1152	3.061452
1083	3.034628	1118	3.048441	1153	3.061829
1084	3.035029	1119	3.048830	1154	3.062205
1085	3.035329	1120	3.049218	1155	3.062582

Num	Logarith.	Num	Logarith.	Num	Logarith.
1156	3.062957	1191	3.075911	1226	3.088490
1157	3.063333	1192	3.076276	1227	3.088844
1158	3.063703	1193	3.076644	1228	3.089198
1159	3.064083	1194	3.077000	1229	3.089551
1160	3.064458	1195	3.077367	1230	3.089905
1161	3.064832	1196	3.077731	1231	3.090258
1162	3.065206	1197	3.078094	1232	3.090610
1163	3.065579	1198	3.078456	1233	3.090963
1164	3.065953	1199	3.078819	1234	3.091315
1165	3.066325	1200	3.079181	1235	3.091666
1166	3.066698	1201	3.079543	1236	3.092018
1167	3.067070	1202	3.079904	1237	3.092369
1168	3.067442	1203	3.080265	1238	3.092720
1169	3.067814	1204	3.080626	1239	3.093071
1170	3.068185	1205	3.080987	1240	3.093421
1171	3.068556	1206	3.081347	1241	3.093771
1172	3.068927	1207	3.081707	1242	3.094121
1173	3.069298	1208	3.082065	1243	3.094471
1174	3.069668	1209	3.082426	1244	3.094820
1175	3.070037	1210	3.082785	1245	3.095169
1176	3.070407	1211	3.083644	1246	3.095518
1177	3.070776	1212	3.083502	1247	3.095866
1178	3.071145	1213	3.083860	1248	3.096214
1179	3.071513	1214	3.084218	1249	3.096562
1180	3.071882	1215	3.084576	1250	3.096910
1181	3.072249	1216	3.084933	1251	3.097257
1182	3.072617	1217	3.085290	1252	3.097604
1183	3.072984	1218	3.085647	1253	3.097951
1184	3.073351	1219	3.086003	1254	3.098297
1185	3.073718	1220	3.086359	1255	3.098643
1186	3.074084	1221	3.086715	1256	3.098989
1187	3.074450	1222	3.087071	1257	3.099335
1188	3.074816	1223	3.087426	1258	3.099680
1189	3.075181	1224	3.087781	1259	3.000025
1190	3.075547	1225	3.088136	1260	3.000370

Num	Logarith.	Num	Logarith.	Num	Logarith.
1261	3. 100715	1296	3. 112605	1331	3. 124178
1262	3. 101059	1297	3. 112940	1332	3. 124504
1263	3. 101403	1298	3. 113274	1333	3. 124830
1264	3. 101747	1299	3. 113609	1334	3. 125155
1265	3. 103090	1300	3 113943	1335	3 125481
1266	3. 102433	1301	3. 114277	1336	2. 125806
1267	3. 102776	1302	3. 114611	1337	3. 126131
1268	3. 103119	1303	3. 114944	1338	3. 126456
1269	3. 103461	1304	3. 115277	1339	3. 126780
1270	3. 103803	1305	3. 115610	1340	3. 127104
1271	3. 104145	1306	3. 115943	1341	3. 127428
1272	3. 104407	1307	3. 116275	1342	3. 127752
1273	3. 104848	1308	3. 116607	1343	3. 128076
1274	3. 105669	1309	3. 116939	1344	3. 128399
1275	3. 105510	1310	3. 117271	1345	3. 128722
1276	3. 105850	1311	3. 117602	1346	3. 129045
1277	3. 106190	1312	3. 117933	1347	3. 129367
1278	3. 106530	1313	3. 118264	1348	3. 129689
1279	3. 106870	1314	3. 118595	1349	3. 130010
1280	3. 107210	1315	3. 118925	1350	3. 130331
1281	3. 107549	1316	3. 119255	1351	3. 130655
1282	3. 107888	1317	3. 119585	1352	3. 130976
1283	3. 108226	1318	3. 119915	1353	3. 131297
1284	3 108565	1319	3 120244	1354	3. 131618
1285	3. 108903	1320	3 120573	1355	3. 131939
1286	3. 109241	1321	3. 120902	1356	3. 132259
1287	3. 109578	1322	3. 121231	1357	3. 132579
1288	3. 109915	1323	3. 121559	1358	3. 132899
1289	3. 110252	1324	3. 121888	1359	3. 133219
1290	3. 110589	1325	3 122215	1360	3. 133528
1291	3. 110926	1326	3. 122543	1361	3. 133858
1292	3. 111262	1327	3. 122870	1362	3. 134177
1293	3. 111598	1328	3. 123198	1363	3. 134495
1294	3. 111934	1329	3. 123527	1364	3. 134814
1295	3. 112269	1330	3. 123851	1365	3. 135132

Num	Logarith.	Num	Logarith.	Num	Logarith.
1366	3. 135450	1401	3. 146438	1436	3. 157154
1367	3. 135768	1402	3. 146748	1437	3. 157456
1368	3. 136086	1403	3. 147057	1438	3. 157758
1369	3. 136404	1404	3. 147367	1439	3. 158060
1370	3. 136720	1405	3. 144676	1440	3. 158362
1371	3. 137037	1406	3. 147985	1441	3. 158664
1372	3. 137364	1407	3. 148294	1442	3. 158965
1373	3. 137670	1408	3. 148602	1443	3. 159266
1374	3. 137986	1409	3. 148911	1444	3. 159567
1375	3. 138302	1410	3. 149219	1445	3. 159867
1376	3. 138618	1411	3. 149527	1446	3. 160168
1377	3. 138933	1412	3. 149834	1447	3. 160468
1378	3. 139249	1413	3. 150142	1448	3. 161768
1379	3. 139564	1414	3. 150449	1449	3. 161068
1380	3. 139879	1415	3. 150756	1450	3. 161368
1381	3. 140193	1416	3. 151063	1451	3. 161667
1382	3. 140508	1417	3. 151369	1452	3. 161966
1383	3. 140822	1418	3. 151676	1453	3. 162265
1384	3. 141136	1416	3. 151982	1454	3. 162564
1385	3. 141446	1420	3. 152288	1455	3. 162863
1386	3. 141763	1421	3. 152594	1456	3. 163161
1387	3. 142076	1422	3. 152899	1457	3. 163450
1388	3. 142389	1423	3. 153204	1458	3. 163757
1389	3. 142702	1424	3. 153510	1459	3. 164055
1390	3. 143014	1425	3. 153814	1460	3. 164352
1391	3. 143327	1426	3. 154119	1461	3. 164650
1392	3. 143639	1327	3. 154424	1462	3. 164941
1393	3. 143951	1428	3. 154728	1463	3. 165244
1394	3. 144262	1429	3. 155032	1464	3. 165541
1395	3. 144574	1430	3. 155336	1465	3. 165837
1396	3. 143885	1431	3. 155639	1466	3. 166134
1397	3. 145196	1432	3. 155943	1467	3. 196430
1398	3. 145407	1423	3. 156246	1468	3. 166726
1399	3. 145817	1434	3. 156549	1469	3. 167021
1400	3. 146128	1435	3. 156851	1470	3. 167317

Num	Logarith.	Num	Logarith.	Num	Logarith.
1471	3. 167612	1506	3. 177825	1541	3. 187802
1472	3. 167907	1507	3. 178113	1542	3. 188085
1473	3. 168202	1508	3. 178401	1543	3. 188365
1474	3. 168497	1509	3. 178689	1544	3. 188647
1475	3. 168792	1510	3. 178976	1545	3. 188928
1476	3. 169086	1511	3. 179264	1546	3. 189209
1477	3. 169380	1512	3. 179551	1547	3. 189490
1478	3. 169674	1513	3. 179839	1548	3. 189770
1479	3. 169968	1514	3. 180145	1544	3. 190052
1480	3. 170261	1515	3. 180412	1550	3. 190331
1481	3. 170555	1516	3. 180699	1651	3. 190611
1482	3. 170848	1517	3. 180985	1552	3. 190891
1483	3. 171141	1518	3. 181271	1553	3. 191171
1484	3. 171433	1519	3. 181557	1554	3. 191451
1485	3. 171726	1520	3. 181843	1555	3. 191730
1486	3. 172018	1521	3. 182129	1556	3. 192009
1487	3. 172311	1522	3. 182414	1557	3. 192288
1488	3. 172602	1523	3. 182699	1558	3. 192564
1489	3. 172894	1524	3. 182985	1559	3. 192846
1490	3. 173186	1525	3. 183269	1560	3. 193124
1491	3. 173477	1526	3. 183554	1561	3. 193402
1492	3. 173768	1527	3. 183839	1562	3. 193681
1493	3. 174059	1528	3. 184123	1563	3. 193959
1494	3. 174350	1529	3. 184407	1564	3. 194236
1495	3. 174641	1530	3. 184691	1565	3. 194514
1496	3. 174931	1531	3. 184975	1566	3. 194791
1497	3. 175221	1532	3. 185258	1567	3. 195069
1498	3. 175511	1533	3. 185542	1568	3. 195346
1499	3. 175801	1534	3. 185835	1569	3. 195622
1500	3. 176091	1535	3. 186108	1570	3. 195899
1501	3. 176380	1536	3. 186391	1571	3. 196176
1502	3. 176669	1537	3. 186673	1572	3. 196452
1503	3. 176959	1538	3. 186956	1573	3. 196728
1504	3. 177247	1539	3. 187236	1574	3. 197004
1505	3. 177536	1540	3. 187520	1575	3. 197280

Num	Logarith.	Num	Logarith.	Num	Logarith.
1576	3. 197556	1611	3. 207095	1656	3. 216429
1577	3. 197831	1612	3. 207365	1647	3. 216693
1578	3. 198107	1613	3. 207634	1648	3. 216957
1579	3. 198382	1614	3. 207903	1649	3. 217220
1580	3. 198657	1615	3. 208172	1650	3. 217483
1581	3. 198931	1616	3. 208441	1651	3. 217747
1582	3. 199206	1617	3. 208710	1652	3. 218010
1583	3. 199480	1618	3. 208978	1653	3. 218272
1584	3. 199755	1619	3. 209246	1654	3. 218535
1585	3. 200029	1620	3. 209515	1655	3. 218798
1586	3. 200303	1621	3. 209783	1656	3. 219060
1587	3. 200576	1622	3. 210050	1657	3. 219322
1588	3. 200850	1623	3. 210318	1658	3. 219584
1589	3. 201123	1624	3. 210586	1659	3. 219846
1590	3. 201397	1625	3. 210853	1660	3. 220108
1591	3. 201670	1626	3. 211120	1661	3. 220369
1592	3. 201943	1627	3. 211387	1662	3. 220631
1593	3. 202215	2628	3. 211654	1663	3. 220892
1594	3. 202488	1629	3. 211921	1664	3. 221153
1595	3. 202760	1630	3. 212187	1665	3. 221414
1596	3. 203032	1631	3. 212454	1666	3. 221675
1597	3. 203304	1632	3. 212720	1667	3. 221935
1598	3. 203576	1633	3. 212982	1668	3. 222196
1599	3. 203848	1634	3. 213252	1669	3. 222456
1600	3. 204120	1635	3. 213517	1670	3. 222716
1601	3. 204391	1636	3. 213783	1671	3. 222976
1602	3. 204662	1637	3. 214048	1672	3. 223236
1603	3. 204933	1638	3. 214313	1673	3. 223495
1604	3. 205204	1639	3. 214578	1674	3. 223755
1605	3. 205475	1640	3. 214843	1675	3. 224014
1606	3. 205745	1641	3. 215008	1676	3. 224274
1607	3. 206015	1642	3. 215373	1677	3. 224533
1608	3. 206286	1643	3. 215637	1678	3. 224792
1609	3. 206556	1644	3. 215901	1679	3. 225050
1610	3. 206825	1645	3. 216165	1680	3. 225309

Num	Logarith.	Num	Logarith.	Num	Logarith.
1681	3. 225567	1716	3. 234517	1751	3. 243286
1682	3. 225826	1717	3. 234770	1752	3. 243534
1683	3. 226084	1718	3. 235023	1753	3. 243781
1684	3. 226342	1719	3. 235275	1754	3. 244029
1685	3. 226599	1720	3. 235528	1755	3. 244277
1686	3. 226857	1721	3. 235780	1756	3. 244524
1687	3 227117	1722	3. 236033	1757	3. 244771
1688	3. 227372	1723	3. 236285	1758	3. 245018
1689	3. 226639	1724	3. 236537	1759	3. 245265
1690	3 227886	1725	3. 236789	1760	3. 245512
1691	3. 228143	1726	3. 237040	1761	3. 245759
1692	3. 228400	1727	3. 237292	1762	3. 246005
1693	3. 228657	1728	3. 237543	1763	3. 246252
1694	3. 228913	1729	3. 237795	1764	3. 246498
1695	3. 229169	1730	3. 238046	1765	3. 246744
1696	3. 229425	1731	3. 238297	1766	3. 246990
1697	3. 229681	1732	3. 238547	1767	3. 247236
1698	3. 229937	1733	3. 238798	1768	3. 247482
1699	3. 230193	1734	3. 239049	1769	3. 247727
1700	3. 230448	1735	3. 239299	1770	3 247973
1701	3. 230704	1736	3. 239549	1771	3. 248218
1702	3. 230959	1737	3. 239799	1772	3. 248463
1703	3. 231214	1738	3. 240049	1773	3. 248708
1704	3. 231469	1739	3. 240299	1774	3. 248953
1705	3. 231724	1740	3. 240549	1775	3. 249198
1706	3. 231979	1741	3. 240798	1776	3. 249443
1707	3. 232233	1742	3. 241048	1777	3. 249687
1708	3. 232487	1743	3. 241297	1778	3. 249931
1709	3. 232742	1744	3. 241546	1778	3. 250175
1710	3. 232996	1745	3. 241795	1780	3. 250420
1711	3. 233250	1746	3. 242044	1781	3. 250663
1712	3. 233503	1747	3. 242292	1782	3. 250907
1713	3. 233757	1748	3. 242541	1783	3. 251151
1714	3. 234010	1749	3. 242789	1784	3. 151394
1715	3. 234264	1750	3. 243038	1785	3. 251638

Num	Logarith.	Num	Logarith.	Num	Logarith.
1786	3. 251881	1821	3. 260309	1856	3. 268578
1787	3. 252124	1822	3. 260548	1857	3. 268811
1788	3. 252367	1823	3. 260786	1858	3. 269045
1789	3. 252610	1824	3. 261024	1859	3. 269279
1790	3. 252853	1825	3. 261262	1860	3. 269512
1791	3. 253095	1826	3. 261500	1861	3. 269746
1792	3. 253338	1827	3. 261738	1862	3. 269979
1793	3. 253580	1828	3. 261976	1863	3. 270212
1794	3. 253822	1829	3. 262213	1864	3. 270445
1795	3. 254064	1830	3. 262451	1865	2. 270678
1796	3. 254036	1831	3. 262688	1866	3. 270911
1797	3. 254548	1832	3. 262925	1867	3. 271144
1798	3. 254789	1833	3. 263162	1868	3. 271375
1799	3. 255031	1834	3. 263399	1869	3. 271609
1800	3. 255272	1835	3. 263636	1870	3. 271841
1801	3. 255513	1836	3. 263872	1871	3. 272073
1802	3. 255754	1837	3. 264109	1872	3. 272305
1803	3. 255995	1838	3. 264345	1873	3. 272537
1804	3. 256236	1839	3. 264581	1874	3. 272769
1805	3. 256477	1840	3. 264817	1875	3. 273001
1806	3. 256717	1841	3. 265053	1776	3. 273222
1807	3. 256958	1842	3. 265289	1877	3. 273464
1808	3. 257198	1843	3. 265525	1878	3. 273695
1809	3. 257438	1844	3. 265760	1879	3. 273926
1810	3. 257678	1845	3. 265906	1880	3. 274157
1811	3. 257918	1846	3. 266231	1881	3. 274388
1812	3. 258158	1847	3. 266465	1882	3. 274619
1813	3. 258397	1848	3. 266702	1883	3. 274850
1814	3. 258637	1849	3. 266936	1884	3. 275080
1815	3. 258876	1850	3. 267171	1885	3. 275311
1816	3. 259115	1851	3. 267406	1886	3. 275541
1817	3. 259354	1852	3. 267641	1887	3. 275771
1818	3. 259593	1853	3. 267875	1888	3. 276002
1819	3. 259832	1854	3. 268109	1889	3. 276232
1820	3. 260071	1855	3. 268343	1890	3. 276461

Num	Logarith.	Num	Logarith.	Num	Logarith.
1891	3.276691	1926	3.284656	1961	3.292477
1892	3.276921	1927	3.284881	1962	3.292699
1893	3.277150	1928	3.285107	1963	3.292920
1894	3.277380	1929	3.285332	1964	3.293141
1895	3.277609	1930	3.285557	1965	3.293362
1896	3.277838	1931	3.285782	1966	3.293583
1897	3.278067	1932	3.286007	1967	3.293804
1898	3.278296	1933	3.286231	1968	3.294025
1899	3.278525	1934	3.286456	1969	3.294245
1900	3.278353	1935	3.286681	1970	3.294466
1901	3.278982	1936	3.286905	1971	3.294686
1902	3.279210	1937	3.287129	1972	3.294906
1903	3.279438	1938	3.287353	1973	3.295127
1904	3.279666	1939	3.287577	1974	3.295347
1905	3.279895	1940	3.287801	1975	3.295567
1906	3.280122	1941	3.288025	1976	3.295786
1907	3.280350	1942	3.288249	1977	3.296006
1908	3.280578	1943	3.288472	1978	3.296226
1909	3.280805	1944	3.288699	1979	3.296445
1910	3.281003	1945	3.288916	1980	3.296665
1911	3.281260	1946	3.289142	1981	3.296884
1912	3.281487	1947	3.289365	1982	3.297103
1913	3.281715	1948	3.289588	1983	3.297322
1914	3.281941	1949	3.289811	1984	3.297541
1915	3.282168	1950	3.290024	1985	3.297760
1916	3.282395	1951	3.290257	1986	3.267979
1917	3.282622	1952	3.290479	1987	3.298197
1918	3.282848	1953	3.290702	1988	3.298416
1919	3.283075	1954	3.290924	1989	3.298631
1920	3.283301	1955	3.291146	1990	3.298853
1921	3.283527	1956	3.291368	1991	3.299071
1922	3.283753	1957	3.291590	1992	3.299289
1923	3.283979	1958	3.291812	1993	3.299507
1924	3.284205	1959	3.292034	1994	3.299725
1925	3.284430	1960	3.292256	1995	3.299942

Num	Logarith.	Num	Logarith.	Num	Logarith.
1996	3.300160	2031	3.307709	2066	3.315130
1997	3.300378	2032	3.307923	2067	3.315340
1998	3.300595	2033	3.308137	2068	3.315550
1999	3.300812	2034	3.308350	2069	3.315760
2000	3.301030	2035	3.308564	2070	3.315970
2001	3.301247	2036	3.308777	2071	3.316180
2002	3.301464	2037	3.308991	2072	3.316389
2003	3.301680	2038	3.309204	2073	3.316599
2004	3.301897	2039	3.309417	2074	3.316808
2005	3.302114	2040	3.309630	2075	3.317018
2006	3.302330	2041	3.309843	2076	3.317227
2007	3.302547	2042	3.310055	2077	3.317436
2008	3.302763	2043	3.310268	2078	3.317645
2009	3.302979	2044	3.310480	2079	3.317854
2010	3.303196	2045	3.310693	2080	3.318063
2011	3.303412	2046	3.310905	2081	3.318272
2012	3.303628	2047	3.311117	2082	3.318480
2013	3.303843	2048	3.311329	2083	3.318689
2014	3.304059	2049	3.311542	2084	3.318897
2015	3.304275	2050	3.311753	2085	3.319106
2016	3.304490	2051	3.311965	2086	3.319314
2017	3.304705	2052	3.312177	2087	3.319522
2018	3.304921	2053	3.312388	2088	3.319730
2019	3.305136	2054	3.312600	2089	3.319938
2020	3.305351	2055	3.312811	2090	3.320146
2021	3.305566	2056	3.313023	2091	3.320354
2022	3.305781	2057	3.313234	2092	3.320561
2023	3.305995	2058	3.313445	2093	3.320769
2024	3.306210	2059	3.313656	2064	3.320976
2025	3.306425	2060	3.313867	2095	3.321184
2026	3.306639	2061	3.314078	2096	3.321391
2027	3.306853	2062	3.314288	2097	3.321598
2028	3.307067	2063	3.314499	2098	3.321805
2029	3.307282	2064	3.314709	2099	3.322012
2030	3.307496	2065	3.314920	2100	3.322219

Num	Logarith.	Num	Logarith.	Num	Logarith.
2101	3.322426	2136	3.329601	2171	3.336659
2102	3.322632	2137	3.329804	2172	3.336859
2103	3.322839	2138	3.330007	2173	3.337059
2104	3.323045	2139	3.330210	2174	3.337259
2105	3.323252	2140	3.330413	2175	3.337459
2106	3.323458	2141	3.330616	2176	3.337658
2107	3.323664	2142	3.330819	2177	3.337858
2108	3.323870	2143	3.331022	2178	3.338057
2109	3.324076	2144	3.331224	2179	3.338257
2110	3.324282	2145	3.331427	2180	3.338456
2111	3.324488	2146	3.331629	2181	3.338655
2112	3.324693	2147	3.331832	2182	3.338854
2113	3.324899	2148	3.332034	2183	3.339053
2114	3.325105	2149	3.332236	2184	3.339252
2115	3.325310	2150	3.332438	2185	3.339451
2116	3.325515	2151	3.332640	2186	3.339650
2117	3.325720	2152	3.332842	2187	3.339848
2118	3.325926	2153	3.333044	2188	3.340047
2119	3.326131	2154	3.333245	2189	3.340245
2120	3.326335	2155	3.333447	2190	3.340444
2121	3.326540	2156	3.333648	2191	3.340642
2122	3.326745	2157	3.333850	2192	3.340840
2123	3.326950	2158	3.334051	2193	3.341037
2124	3.327154	2159	3.334252	2194	3.341236
2125	3.327358	2160	3.334452	2195	3.341434
2126	3.327563	2161	3.334654	2196	3.341632
2127	3.327767	2162	3.334855	2197	3.341830
2128	3.327971	2163	3.335056	2198	3.342026
2129	3.328175	2164	3.335257	2199	3.342225
2130	3.328379	2165	3.335457	2200	3.342422
2131	3.328582	2166	3.335658	2201	3.342620
2132	3.328786	2167	3.335858	2202	3.342817
2133	3.328990	2168	3.336059	2203	3.343014
2134	3.329194	2169	3.336259	2204	3.343211
2135	3.329397	2170	3.336459	2205	3.343408

Num	Logarith.	Num	Logarith.	Num	Logarith.
2206	3. 343605	2241	3. 350441	2276	3. 357172
2207	3. 343802	2242	3. 350635	2277	3. 357363
2208	3. 343999	2243	3. 350829	2278	3. 357553
2209	3. 344195	2244	3. 351022	2279	3. 357744
2210	3. 344392	2245	3. 351216	2280	3. 357934
2211	3. 344588	2246	3. 351409	2281	3. 358125
2212	3. 344785	2247	3. 351603	2282	3. 358315
2213	3. 344981	2248	3. 351796	2283	3. 358505
2214	3. 345177	2249	3. 351989	2284	3. 358696
2215	3. 345373	2250	3. 352182	2285	3. 358886
2216	3. 345569	2151	3. 352375	2286	3. 359076
2217	3. 345765	2252	3. 352568	2287	3. 359266
2218	3. 345961	2253	3. 352761	2288	3. 359456
2219	3. 346157	2254	3. 352953	2289	3. 359645
2220	3. 346353	2255	3. 353146	2290	3. 359835
2221	3. 346548	2256	3. 353339	2291	3. 360025
2222	3. 346744	2257	3. 353531	2292	3. 360214
2223	3. 346949	2258	3. 353723	2293	3. 360404
2224	3. 347134	2259	3. 353916	2294	3. 360593
2225	3. 347230	2260	3. 354108	2295	3. 360782
2226	3. 347525	2261	3. 354300	2296	3. 360971
2227	3. 347720	2262	3. 354492	2297	3. 361161
2228	3. 347915	2263	3. 354684	2298	3. 361350
2229	3. 348110	2264	3. 354876	2299	3. 361539
2230	3. 348204	2165	3. 355068	2300	3. 361727
2231	3. 348499	2266	3. 355259	2301	3. 361916
2232	3. 348694	2267	3. 355451	2302	3. 362105
2233	3. 348888	2268	3. 355643	2303	3. 362293
2234	3. 349083	2269	3. 355834	2304	3. 362482
2235	3. 349277	2270	3. 366025	2305	3. 362670
2236	3. 349471	2271	3. 356217	2306	3. 362859
2237	3. 349666	2272	3. 356408	2307	3. 363074
2238	3. 349860	2273	3. 356599	2308	3. 363235
2239	3. 350054	2274	3. 356790	2309	3. 363425
2240	3. 350248	2275	3. 356981	2310	3. 363611

Num	Logarith.	Num	Logarith.	Num	Logarith.
2311	3. 363800	2346	3. 370328	2381	3. 376799
2312	3. 363987	2347	3. 370513	2382	3. 376941
2313	3. 364175	2348	3. 370698	2383	3. 377124
2314	3. 364364	2349	3. 370883	2384	3. 377307
2315	3. 364551	2350	3. 371067	2385	3. 377488
2316	3. 364738	2351	3. 371252	2386	3. 377670
2317	3. 364926	2352	3. 371437	2387	3. 377852
2318	3. 365113	2353	3. 371621	2388	3. 378034
2319	3. 365300	2354	3. 371806	2389	3. 378256
2320	3. 365488	2355	3. 371990	2390	3. 378397
2321	3. 365675	2356	3. 372175	2391	3. 378579
2322	3. 365862	2357	3. 372359	2392	3. 378761
2323	3. 366049	2358	3. 372543	2393	3. 378942
2324	3. 366236	2359	3. 372727	2394	3. 379124
2325	3. 366423	2360	3. 372912	2395	3. 379305
2326	3. 366609	2361	3. 373096	2396	3. 379486
2327	3. 366796	2362	3. 373279	2397	3. 379668
2328	3. 366983	2363	3. 373463	2398	3. 379849
2329	3. 367169	2364	3. 373647	2399	3. 380030
2330	3. 367255	2365	3. 373831	2400	3. 380211
2331	3. 367542	2366	3. 374014	2401	3. 380392
2332	3. 367728	2367	3. 374198	2402	3. 380573
2333	3. 367914	2368	3. 374381	2403	3. 380753
2334	3. 368100	2369	3. 374565	2404	3. 380934
2335	3. 368286	2370	3. 374748	2405	3. 381115
2336	3. 368472	2371	3. 374931	2406	3. 381295
2337	3. 368658	2372	3. 375114	2407	3. 381476
2338	3. 368844	2373	3. 375297	2408	3. 381656
2339	3. 369030	2374	3. 375480	2409	3. 381836
2340	3. 369215	2375	3. 375663	2410	3. 382017
2341	3. 369401	2376	3. 375846	2411	3. 382197
2342	3. 369586	2377	3. 376029	2412	3. 382377
2343	3. 369772	2378	3. 376211	2413	3. 382557
2344	3. 369957	2379	3. 376394	2414	3. 382737
2345	3. 370142	2380	3. 376576	2415	3. 382917

Num	Logarith.	Num	Logarith.	Num	Logarith.
2416	3.383096	2451	3.389343	2486	3.395501
2417	3.383276	2452	3.389520	2487	3.395675
2418	3.383456	2453	3.389697	2488	3.395850
2419	3.383635	2454	3.389874	2489	3.396024
2420	3.383815	2455	3.390051	2490	3.396199
2421	3.383994	2456	3.390228	2491	3.396373
2422	3.384174	2457	3.390405	2492	3.396548
2423	3.384353	2458	3.390581	2493	3.396722
2424	3.384532	2459	3.390758	2494	3.396896
2425	3.384711	2460	3.390935	2495	3.397070
2426	3.384890	2461	3.391111	2496	3.397244
2427	3.385069	2462	3.391288	2497	3.397418
2428	3.385248	2463	3.391464	2498	3.397592
2429	3.385427	2464	3.391640	2499	3.397766
2430	3.385606	2465	3.391816	2500	3.397940
2431	3.385785	2466	3.391993	2501	3.398113
2432	3.385963	2467	3.392169	2502	3.398287
2433	3.386142	2468	3.392345	2503	3.398460
2434	3.386320	2469	3.392521	2504	3.398634
2435	3.386499	2470	3.392696	2505	3.398807
2436	3.386677	2471	3.392872	2506	3.398981
2437	3.386855	2472	3.393048	2507	3.399154
2438	3.387033	2473	3.393224	2508	3.399327
2439	3.387211	2474	3.393399	2509	3.399500
2440	3.387389	2475	3.393575	2510	3.399673
2441	3.387567	2476	3.393750	2511	3.399846
2442	3.387745	2477	3.393926	2512	3.400019
2443	3.387923	2478	3.394101	2513	3.400192
2444	3.388101	2479	3.394276	2514	3.400365
2445	3.388278	2480	3.394451	2515	3.400538
2446	3.388456	2481	3.394626	2516	3.400710
2447	3.388634	2482	3.394801	2517	3.400883
2448	3.388811	2483	3.394976	2518	3.401055
2449	3.388988	2484	3.395151	2519	3.401228
2450	3.389166	2485	3.395326	2520	3.401402

Num	Logarith.	Num	Logarith.	Num	Logarith.
2521	3.401572	2550	3.407560	2591	3.413467
2522	3.401745	2557	3.407730	2592	3.413635
2523	3.401917	2558	3.407900	2593	3.413802
2524	3.402089	2559	3.408070	2594	3.413970
2525	3.402261	2560	3.408240	2595	3.414137
2526	3.402433	2561	3.408409	2596	3.414304
2527	3.402605	2562	3.408579	2597	3.414471
2528	3.402777	2563	3.408748	2598	3.414639
2529	3.402948	2564	3.408918	2599	3.414806
2530	3.403120	2565	3.409087	2600	3.414973
2531	3.403292	2566	3.409256	2601	3.415140
2532	3.403463	2567	3.409425	2602	3.415307
2533	3.403635	2568	3.409595	2603	3.415474
2534	3.403806	2569	3.409764	2604	3.415641
2535	3.403978	2570	3.409933	2605	3.415807
2536	3.404149	2571	3.410102	2606	3.415974
2537	3.404320	2572	3.410271	2607	3.416141
2538	3.404491	1573	3.410439	2608	3.416307
2539	3.404662	2574	3.410608	2609	3.416474
2540	3.404833	2575	3.410777	2610	3.416630
2541	3.405004	2570	3.410945	2611	3.416806
2542	3.405175	2577	3.411114	2612	3.416973
2543	3.405346	2578	3.411282	1613	3.417139
2544	3.405517	2579	3.411451	2614	3.417305
2545	3.405687	2580	3.411619	2615	3.417471
2546	3.405858	2581	3.411788	2616	3.417937
2547	3.406028	2582	3.411956	2617	3.417803
2548	3.406199	2583	3.412124	2618	3.417969
2549	3.406369	2584	3.412292	2619	3.418135
2550	3.406540	2585	3.412460	2620	3.418301
2551	3.406710	2506	3.412620	2621	3.418467
2552	3.406880	2587	3.412796	2622	3.418632
2553	3.407050	2588	3.412964	2623	3.418798
2554	3.407220	2589	3.413132	2624	3.418963
2555	3.407390	2590	3.413299	2625	3.419129

Num	Logarith.	Num	Logarith.	Num	Logarith.
2626	3. 419274	2661	3. 425044	2696	3. 430719
2627	3. 419466	2662	3. 425208	2697	3. 430880
2628	3. 419625	2663	3. 425371	2698	3. 431041
2629	3. 419790	2664	3. 425534	2699	3. 431202
2630	3. 419955	2665	3. 425697	2700	3. 431363
2631	3. 420120	2666	3. 425863	2701	3. 431524
2632	3. 420285	2667	3. 426026	2702	3. 431685
2633	3. 420450	2668	3. 426189	2703	3. 431846
2634	3. 420615	2669	3. 426341	2704	3. 432006
2635	3. 420780	2670	3. 426513	2705	3. 432167
2636	3. 420945	2671	3. 426673	2706	3. 432327
2637	3. 421110	2672	3. 426836	2707	3. 432488
2638	3. 421274	2673	3. 426999	2708	3. 432648
2639	3. 411439	2674	3. 427161	2709	3. 432809
2640	3. 421603	2675	3. 427323	2710	3. 432969
2641	3. 421768	2676	3. 427486	2711	3. 433129
2642	3. 421932	2677	3. 427648	2712	3. 433289
2643	3. 422097	2678	3. 427810	2713	3. 433449
2644	3. 422261	2679	3. 427972	2714	3. 433609
2645	3. 422429	2680	3. 428134	2715	3. 433769
2646	3. 422589	2681	3. 428296	2716	3. 433929
2647	3. 422753	2682	3. 428458	2717	3. 434089
2648	3. 422918	2683	3. 428620	2718	3. 434249
2649	3. 423082	2684	3. 428782	2719	3. 434409
2650	3. 423245	2685	3. 428944	2720	3. 434568
2651	3. 423409	2686	3. 429106	2721	3. 434728
2652	3. 423573	2687	3. 429267	2722	3. 434888
2653	3. 423737	2688	3. 429429	2723	3. 435047
2654	3. 423900	2689	3. 429590	2724	3. 435207
2655	3. 424064	2690	3. 429752	2725	3. 435366
2656	3. 424220	2691	3. 429913	2726	3. 435525
2657	3. 424391	2692	3. 430075	2727	3. 435685
2658	3. 424555	2693	3. 430236	2728	3. 435844
2659	3. 424718	2694	3. 430397	2729	3. 436003
2660	3. 424881	2695	3. 430558	2730	3. 436162

Num	Logarith.	Num	Logarith.	Num	Logarith.
2731	3.436321	2766	3.441852	2801	3.447313
2732	3.436480	2767	3.442009	2802	3.447468
2733	3.436639	2768	3.442166	2803	3.447623
2734	3.436798	2769	3.442322	2804	3.447778
2735	3.436957	2770	3.442479	2805	3.447932
2736	3.437116	2771	3.442636	2806	3.448087
2737	3.437274	2772	3.442793	2807	3.448242
2738	3.437433	2773	3.442949	2808	3.448397
2739	3.437592	2774	3.443106	2809	3.448551
2740	3.437750	2775	3.443263	2810	3.448706
2741	3.437909	2776	3.443419	2811	3.448860
2742	3.438067	2777	3.443575	2812	3.449015
2743	3.438225	2778	3.443732	2813	3.449169
2744	3.438384	2779	3.443888	2814	3.449324
2745	3.438542	2780	3.444044	2815	3.449478
2746	3.438700	2781	3.444201	2816	3.449632
2747	3.438858	2782	3.444357	2817	3.449786
2748	3.439016	2783	3.444513	2818	3.449941
2749	3.439174	2784	3.444669	2819	3.450095
2750	3.439332	2785	3.444825	2820	3.450249
2751	3.429490	2786	3.444981	2821	3.450403
2752	3.439648	2787	3.445137	2822	3.450557
2753	3.439806	2788	3.445292	2823	3.450710
2754	3.439963	2789	3.445444	2824	3.450864
2755	3.440121	2790	3.445600	2825	3.451018
2756	3.440279	2791	3.445759	2826	3.451172
2757	3.440436	2792	3.445915	2827	3.451325
2758	3.440594	2793	3.446070	2828	3.451479
2759	3.440751	2794	3.446226	2829	3.451632
2760	3.440909	2795	3.446381	2830	3.451787
2761	3.441066	2796	3.446537	2831	3.451939
2762	3.441223	2797	3.446692	2832	3.452093
2763	3.442380	2798	3.446847	2833	3.452246
2764	3.441538	2799	3.447002	2834	3.452399
2765	3.441695	2800	3.447158	2835	3.452553

Num	Logarith.	Num	Logarith.	Num	Logairth.
2836	3. 452706	2871	3. 458033	2906	3. 463295
2837	3. 452859	2872	3. 458184	2907	3. 463445
2838	3. 453012	2873	3. 458335	2908	3. 463594
2839	3. 453165	2874	3. 458486	2909	3. 463743
2840	3. 453318	2875	3. 458637	2910	3. 463891
2841	3. 453471	2876	3. 458788	2911	3. 464042
2842	3. 453624	2877	3. 458939	2912	3. 464191
2843	3. 453776	2879	3. 459090	2913	3. 464340
2844	3. 453929	2879	3. 459241	2914	3. 464489
2845	3. 454082	2880	3. 459392	2915	3. 464638
2846	3. 454234	2881	3. 459543	2916	3. 464787
2847	3. 454387	2882	3. 459694	2917	3. 464936
2848	3. 454540	2883	3. 459844	2918	3. 465085
2849	3. 454692	2884	3. 459995	2919	3. 465234
2850	3. 454844	2885	3. 460145	2920	3. 465382
2851	3. 454997	2886	3. 460296	2921	3. 465531
2852	3. 455149	2887	3. 460446	2922	3. 465680
2853	3. 455301	2888	3. 460597	2923	3. 465828
2854	3. 455454	2889	3. 460747	2924	3. 465977
2855	3. 455606	2890	3. 460897	2925	3. 466025
2856	3. 455758	2891	3. 461048	2926	3. 466174
2857	3. 455910	2892	3. 461198	2927	3. 466422
2858	3. 456062	2893	3. 461348	2928	3. 466571
2859	3. 456214	2894	3. 461498	2929	3. 466719
2860	3. 456366	2895	3. 461648	2930	3. 465867
2861	3. 456517	2896	3. 461798	2931	3. 467015
2862	3. 456669	2897	3. 461948	2932	3. 467164
2863	3. 456821	2898	3. 462098	2933	3. 467312
2864	3. 456973	2899	3. 462248	2934	3. 467460
2865	3. 457124	2900	3. 462398	2935	3. 467608
2866	3. 467276	2901	3. 462547	2936	3. 467716
2867	3. 457427	2902	3. 462697	2937	3. 467903
2868	3. 457579	2903	3. 462847	2938	3. 468051
2869	3. 457730	2904	3. 462996	2939	3. 468199
2870	3. 457881	2905	3. 463146	2940	3. 468347

Num	Logarith.	Num	Logarith.	Num	Logarith.
2941	3.468495	2976	3.473632	3011	3.478710
2942	3.468642	2977	3.473778	3012	3.478855
2943	3.468790	2978	3.473924	3013	3.478909
2944	3.468937	2979	3.474070	3014	3.479143
2945	3.460085	2980	3.474216	3015	3.479287
2946	3.469232	2981	3.474362	3010	3.479431
2947	3.469380	2982	3.474507	3017	3.479575
2948	3.469527	2983	3.474653	3018	3.479719
2949	3.469674	2984	3.474798	1019	3.479863
2950	3.469822	2985	3.474944	3020	3.480006
2951	3.469969	2986	3.475589	3021	3.480190
2952	3.470116	2987	3.475235	3022	3.480294
2953	3.470263	2988	3.475380	3023	3.480438
2954	3.470410	2989	3.475525	3024	3.480581
2955	3.470557	2990	3.475671	3025	3.480725
2956	3.470704	2991	3.475816	3026	3.480868
2957	3.470851	2992	3.475961	3027	3.481012
2958	3.470998	2993	3.476106	3028	3.481155
2959	3.471145	2994	3.476251	3029	3.481299
2960	3.471291	2995	3.476396	3030	3.481442
2961	3.471438	2996	3.476541	3031	3.481585
2962	3.471585	2997	3.476686	3032	3.481729
2963	3.471731	2998	3.476831	3033	3.[illegible]8[illegible]2
2964	3.471878	2999	1.476976	3034	3.482015
2965	3.471024	3000	3.477121	3035	3.482158
2966	3.472171	3001	3.477266	3036	3.482301
2967	3.472317	3002	3.477410	3037	3.482444
2968	3.472463	3003	3.477555	3038	3.482587
2969	3.472610	3004	3.477699	3036	3.482730
2970	3.472756	3005	3.477844	3040	3.482872
2971	3.472902	3006	3.477589	3041	3.483016
2972	3.473048	3007	3.478133	3042	3.483159
2973	3.473194	3008	3.478277	3043	3.483301
2974	3.473341	3009	3.478422	3044	3.483444
2975	3.473487	3010	3.478566	3035	3.483587

Num	Logarith.	Num	Logarith.	Num	Logarith.
3046	3. 483729	3081	3. 488691	3116	3. 493579
3047	3. 483872	3082	3. 488832	3117	3. 493736
3048	3. 484015	3083	3. 488973	3118	3. 493876
3049	3. 484157	3084	3. 489114	3119	3. 494015
3050	3. 484299	3085	3. 489255	3120	3. 494154
3051	3. 484442	3086	3. 489395	3121	3. 494293
3052	3. 484584	3087	3. 489536	3122	3. 494432
3053	3. 484726	3088	3. 489677	3123	3. 494572
3054	3. 484869	3089	3. 489817	3124	3. 494711
3055	3. 485011	3090	3. 489958	3125	3. 494850
3056	3. 485153	3091	3. 490099	3126	3. 494989
3057	3. 485295	3092	3. 490239	3127	3. 495127
3058	3. 485437	3093	3. 490376	3128	3. 495266
3059	3. 485579	3094	3. 490520	3129	3. 495405
3060	3. 485721	3095	3. 490660	3130	3. 495544
3061	3. 485863	3096	3. 490800	3131	3. 495683
3062	3. 486005	3097	3. 490941	3132	3. 495821
3063	3. 486147	3098	3. 491081	3133	3. 495960
3064	3. 486288	3099	3. 491021	3134	3. 496099
3065	3. 486430	3100	3. 491361	3135	3. 496237
3066	3. 486572	3101	3. 491501	3136	3. 496376
3067	3. 486713	3102	3. 491641	3137	3. 496514
3068	3. 486856	3103	3. 491781	3138	3. 496652
3069	3. 486996	3104	3. 491921	3139	3. 496791
3070	3. 487138	3105	3. 492061	3140	3. 496929
3071	3. 487279	3106	3. 492201	3141	3. 497067
3072	3. 487421	3107	3. 492341	3142	3. 497206
3073	3. 487562	3108	3. 492481	3143	3. 497344
3074	3. 487703	3109	3. 492620	3144	3. 497482
3075	3. 487845	3110	3. 492760	3145	3. 497620
3076	3. 487986	3111	3. 492900	3146	3. 497758
3077	3. 488127	3112	3. 493039	3147	3. 497896
3078	3. 488268	3113	3. 493179	3148	3. 498034
3079	3. 488409	3114	3. 493318	3149	3. 498172
3080	3. 488550	3115	3. 493458	3150	3. 498310

Num	Logarith.	Num	Logarith.	Num	Logarith.
3151	3. 498448	3186	3. 503245	3221	3. 507990
3152	3. 498586	3187	3. 503382	3222	3. 508125
3153	3. 498724	3188	3. 503518	3223	3. 508260
3154	3. 498861	3189	3. 503654	3224	3. 508395
3155	3. 498999	3190	3. 503790	3225	3. 508529
3156	3. 499137	3191	3. 503926	3226	3. 508664
3157	3. 499274	3192	3. 504062	3227	3. 508799
3158	3. 499412	3193	3. 504198	3228	3. 508933
3159	3. 499549	3194	3. 504334	3229	3. 509068
3160	3 499687	3195	3. 504470	3230	3. 509202
316.	3. 499824	3196	3. 504606	3231	3. 509337
3162	3. 499961	3197	3. 504742	3232	3. 509471
3163	3. 500099	3198	3. 504878	3233	3. 509605
3164	3. 500236	3199	3. 505014	3234	3. 509740
3165	3. 500373	3200	3. 505150	3235	3. 509874
3166	3. 500510	3201	3. 505285	3236	3. 510008
3167	3. 500648	3202	3. 505421	3237	3. 510142
3168	3. 500785	3203	3. 505556	3238	3. 510276
3169	3. 500922	3204	3. 505692	3239	3. 510410
3170	3. 501059	3205	3. 505828	3240	3. 510545
3171	3. 501196	3206	3. 505963	3241	3. 510679
3172	3. 501333	3207	3. 506099	3242	3. 510813
3173	3. 501470	3208	3. 506234	3243	3. 510946
3174	3. 501606	3209	3. 506369	3244	3. 511080
3175	3 501743	3210	3. 506509	3245	3. 511214
3176	3. 501880	3211	3. 506640	3246	3. 511348
3177	3. 502017	3212	3. 506775	3 247	3. 311482
3178	3. 502153	3213	3. 506910	3248	3. 511616
3179	3. 502290	3214	3. 507045	3249	3. 511749
3180	3. 502427	3215	3. 507181	3250	3. 511883
3181	3. 502563	4216	3. 507316	3251	3. 512017
3182	3 502700	3217	3. 507451	3252	3. 512150
3183	3. 502836	3218	3. 507586	3253	3. 512284
3184	3. 502973	3219	3 507721	3254	3. 512417
3185	3. 503109	3220	3. 507855	3255	3. 512511

Num	Logarith.	Num	Logarith.	Num	Logarith.
3256	3. 512684	3291	3. 517327	3326	3. 521922
3257	3. 512817	3292	3. 517459	3327	3. 522052
3258	3. 512951	3293	3. 517591	3328	3. 522183
3259	3. 513084	3294	3. 517723	3329	3. 522313
3260	3. 513217	3295	3. 517855	3330	3. 522444
3261	3. 513350	3296	3. 517987	3331	3. 522574
3262	3. 513484	3297	3. 518118	3332	3. 522705
3263	3. 513617	3298	3. 518250	3333	3. 522835
3264	3. 513750	3299	3. 518382	3334	3. 522965
3265	3. 513883	3300	3. 518513	3335	3. 523095
3266	3. 514016	3301	3. 518645	3336	3. 523226
3267	3. 514149	3302	3. 518777	3337	3. 523356
3268	3. 514282	3203	3. 518908	3338	3. 523486
3269	3. 514414	3304	3. 519040	3339	3. 523616
3270	3. 514547	3305	3. 519171	3340	3. 523746
3271	3. 514680	3306	3. 519302	3341	3. 523876
3272	3. 514815	3307	3. 519434	3342	3. 524006
3273	3. 514946	3308	3. 519565	3343	3. 524136
3274	3. 515078	3309	3. 519695	3344	3. 524266
3275	3. 515211	3310	3. 519828	3345	3. 524396
3276	3. 515343	3311	3. 519959	3346	3. 524524
3277	3. 515476	3312	3. 520090	3347	3. 524655
3278	3. 515608	3313	3. 520221	3348	3. 524785
3279	3. 515741	3314	3. 520352	3349	3. 524915
3280	3. 515873	3315	3. 520482	3350	3. 525045
3281	3. 516006	3316	3. 520614	3351	3. 525174
3282	3. 516138	3317	3. 520745	3352	3. 525304
3283	3. 516270	3318	3. 520876	3353	3. 525433
3284	3. 516403	3319	3. 521007	3354	3. 525563
3285	3. 516535	3320	3. 521138	3355	3. 525692
3286	3. 516667	3321	3. 521268	3356	3. 525821
3287	3. 516799	3322	3. 521399	3357	3. 525951
3288	3. 516931	3323	3. 521530	3358	3. 526080
3289	3. 517063	3324	3. 521661	3359	3. 526210
3290	3. 517199	3325	3. 521791	3360	3. 526339

Num	Logarith.	Num	Logarith.	Num	Logarith.
3361	3. 526468	3396	3. 530967	3431	3. 535420
3362	3. 526597	3397	3. 531095	3432	3. 535547
3363	3. 526726	3398	3. 531223	3433	3. 535673
3364	3. 526856	3399	3. 531351	3434	3. 535800
3365	3. 526985	3400	3. 531478	3435	3. 535926
3366	3. 527114	3401	3. 531606	3436	3. 536053
3367	3. 527243	3402	3. 531734	3437	3. 536179
3368	3. 527372	3403	3. 531861	3438	3. 536305
3369	3. 527501	3404	3. 531989	3439	3. 536432
3370	3. 527629	3405	3. 532117	3440	3. 536558
3371	3. 527758	3406	3. 532244	3441	3. 536684
3372	3. 527887	3407	3. 532372	3442	3. 536810
3373	3. 528016	3408	3. 532459	3443	3. 536937
3374	3. 528145	3409	3. 532627	3444	3. 537063
3375	3. 528273	3410	3. 532754	3445	3. 537189
3376	3. 528402	3411	3. 532881	3446	3. 537315
3377	3. 528531	3412	3. 533009	3447	3. 537441
3378	3. 528659	3413	3. 533136	3448	3. 537567
3379	3. 528788	3414	3. 533263	3449	3. 537693
3380	3. 528916	3415	3. 533390	3450	3. 537819
3381	3. 529045	3416	3. 533517	3451	3. 537945
3382	3. 529173	3417	3. 533645	3452	3. 538070
3383	3. 529302	3418	3. 533772	3453	3. 538196
3384	3. 529430	3419	3. 533899	3454	3. 538322
3385	3. 529558	3420	3. 534026	3455	3. 538448
3386	3. 529686	3421	3. 534153	3356	3. 538573
3387	3. 529815	3422	3. 534280	3457	3. 538699
3388	3. 529943	3423	3. 534406	3458	3. 538825
3389	3. 530071	3424	3. 534533	3459	3. 538950
3390	3. 530199	3425	3. 534660	3460	3. 539076
3391	3. 530327	3426	3. 534787	3461	3. 539201
3392	3. 530455	3427	3. 534914	3462	3. 539327
3393	3. 530583	3428	3. 535040	3463	3. 539452
3394	3. 530711	3429	3. 535167	3464	3. 539577
3395	3. 530839	3430	3. 535294	3465	3. 539703

Num	Logarith.	Num	Logarith.	Num	Logarith.
3466	3. 539828	3501	3. 544192	3536	3. 548512
3467	3. 539953	3502	3. 544316	3537	3. 548635
3468	3. 540079	3503	3. 544440	3538	3. 548757
3469	3. 540204	3504	3. 544564	3539	3. 548880
3470	3. 540329	3505	3. 544688	3540	3. 549003
3471	3. 540454	3506	3. 544811	3541	3. 549125
3472	3. 540579	3507	3. 544935	3542	3. 549248
3473	3. 540704	3508	3. 545059	3543	3. 549371
3474	3. 540829	3509	3. 545183	3544	3. 549493
3475	3. 540954	3510	3. 545307	3545	3. 549616
3476	3. 541079	3511	3. 545430	3546	3. 549738
3477	3. 541204	3512	3. 545554	3547	3. 549861
3478	3. 541329	3513	3. 545678	3548	3. 549983
3479	3. 541454	3514	3. 545801	3549	3. 550106
3480	3. 541579	3515	3. 545925	3550	3. 550228
3481	3. 541704	3516	3. 546048	3551	3. 550350
3482	3. 541828	3517	3. 546172	3552	3. 550473
3483	3. 541953	3518	3. 546295	3553	3. 550591
3484	3. 542078	3519	3. 546419	3554	3. 550717
3485	3. 542202	3520	3. 546542	3555	3. 550839
3486	3. 542321	3521	3. 546665	3556	3. 550961
3487	3. 542457	3522	3. 546789	3557	3. 551083
3488	3. 542576	3523	3. 546912	3558	3. 551205
3489	3. 542701	3524	3. 547035	3559	3. 551328
3490	3. 542821	3525	3. 547159	3560	3. 551450
3491	3. 542949	3526	3. 547282	3561	3. 551572
3492	3. 543074	3527	3. 547405	3562	3. 551693
3493	3. 543198	3528	3. 547528	3563	3. 551815
3494	3. 543302	3529	3. 547651	3564	3. 551937
3495	3. 543447	3530	3. 547774	3565	3. 552059
3496	3. 543571	3531	3. 547897	3566	3. 552181
3497	3. 543695	3532	3. 548020	3567	3. 552303
3498	3. 543819	3533	3. 548143	3568	3. 552424
3499	3. 543943	3534	3. 548266	3569	3. 552546
3500	3. 544063	3535	3. 548389	3570	3. 552668

Num	Logarith.	Num	Logarith.	Num	Logarith.
3571	3. 552789	3606	3. 557025	3641	3. 561220
3572	3. 552911	3607	3. 557146	3642	3. 561339
3573	3. 553033	3608	3. 557266	3643	3. 561459
3574	3. 553154	3609	3. 557386	3644	3. 561578
3575	3. 553276	3610	3. 557507	3645	3. 561697
3576	3. 553397	3611	3. 557627	3646	3. 561816
3577	3. 553518	3612	3. 557747	3647	3. 561935
3778	3. 553640	3613	3. 557868	3648	3. 562054
3579	3. 553761	3614	3. 557988	3649	3. 562173
3580	3. 553883	3615	3. 558108	3650	3. 562292
3581	3. 554004	3616	3. 558228	3651	3. 562411
3582	3. 554125	3617	3. 558348	3652	3. 562530
3583	3. 554246	3618	3. 558468	3653	3. 562649
3584	3. 554368	3619	3. 558588	3654	3. 562768
3585	3. 554489	3620	3. 558708	3655	3. 562887
3586	3. 554610	3621	3. 558828	3656	3. 563006
3587	3. 554731	3622	3. 558948	3657	3. 563125
3588	3. 554852	3623	3. 559068	3658	3. 563243
3589	3. 554973	3624	3. 559188	3659	3. 563362
3590	3. 555094	3625	3. 559308	3660	3. 563481
3591	3. 555215	3626	3. 559427	3661	3. 563599
3592	3. 555336	3627	3. 559547	3662	3. 563718
3593	3. 555457	3628	3. 559667	3663	3. 563836
3594	3. 555577	3629	3. 559787	3664	3. 563955
3595	3. 555698	3630	3. 559906	3665	3. 564074
3596	3. 555819	3631	3. 560026	3666	3. 564192
3597	3. 555940	3632	3. 560145	3667	3. 564310
3598	3. 556061	3633	3. 560265	3668	3. 564429
3599	3. 556181	3634	3. 560384	3669	3. 564547
3600	3. 556302	3635	3. 560504	3670	3. 564666
3601	3. 556423	3636	3. 560633	3671	3. 564784
3602	3. 556543	3637	3. 560743	3672	3. 564902
3603	3. 556664	3638	3. 560862	3673	3. 565020
3604	3. 556785	3639	3. 560982	3674	3. 565139
3605	3. 556905	3640	3. 561101	3675	3. 565256

Num	Logarith.	Num	Logarith.	Num	Logarith.
3676	3. 565375	3711	3. 569491	3746	3. 573567
3677	3. 565493	3712	3. 569608	3747	3. 573683
3678	3. 565611	3713	3. 569724	3748	3. 573799
3679	3. 565729	3714	3. 569841	3749	3. 573915
3680	3. 565847	3715	3. 569958	3750	3. 574031
3681	3. 565965	3716	3. 570075	3751	3. 574147
3682	3. 566083	3717	3. 570192	3752	3. 574262
3683	3. 566201	3718	3. 570309	3753	3. 574378
3684	3. 566319	3719	3. 570426	3754	3. 574491
3685	3. 566437	3720	3. 570542	3755	3. 574609
3686	3. 566555	3721	3. 570659	3756	3. 574725
3687	3. 566673	3722	3. 570776	3757	3. 574841
3688	3. 566790	3723	3. 570893	3758	3. 574956
3689	3. 566908	3724	3. 571009	3759	3. 575072
3690	3. 567026	3725	3. 571126	3760	3. 575187
3691	3. 567144	3726	3. 571242	3761	3. 575303
3692	3. 567261	3727	3. 571359	3762	3. 575418
3693	3. 567379	3728	3. 571475	3763	3. 575534
3694	3. 567496	3729	3. 571592	3764	3. 575649
3695	3. 567614	3730	3. 571708	3765	3. 575765
3696	3. 567732	3731	3. 571825	3766	3. 575880
3697	3. 567849	3732	3. 571941	3767	3. 575995
3698	3. 567966	3733	3. 572058	3768	3. 576111
3699	3. 568084	3734	3. 572174	3769	3. 576226
3700	3. 568201	3735	3. 572296	3770	3. 576341
3701	3. 568319	3736	3. 572406	3771	3. 576456
3702	3. 568436	3737	3. 572523	3752	3. 576571
3703	3. 568553	3738	3. 572639	3773	3. 576686
3704	3. 568671	3739	3. 572755	3774	3. 576801
3705	3. 568788	3740	3. 572871	3775	3. 576916
3706	3. 568905	3741	3. 572987	3776	3. 577032
3707	3. 569022	3742	3. 573103	3777	3. 577147
3708	3. 569139	3743	3. 573219	3778	3. 577262
3709	3. 569256	3744	3. 573335	3779	3. 577376
3710	3. 569373	3745	3. 573451	3780	3. 577491

Num	Logarith.	Num	Logarith.	Num	Logarith.
3781	3. 577606	3816	3. 581608	3851	3. 585573
3782	3. 577721	3817	3. 581722	3852	3. 585686
3783	3. 577836	3818	3. 581835	3853	3. 585799
3784	3. 577951	3819	3. 581949	3854	3. 585911
3785	3. 578065	3820	3. 582063	3855	3. 586024
3786	3. 578180	3821	3. 582177	3856	3. 586137
3787	3. 578295	3822	3. 582290	3857	3. 586249
3788	3. 578410	3823	3. 582404	3858	3. 586362
3789	3. 578524	3824	3. 582517	3859	3. 586474
3790	3. 578639	3825	3. 582631	3860	3. 586587
3791	3. 578753	3826	3. 582745	3861	3. 586699
3792	3. 578868	3827	3. 582858	3862	3. 586812
3793	3. 578982	3828	3. 582971	3863	3. 586924
3794	3. 579097	3829	3. 583085	3864	3. 587037
3795	3. 579211	3830	3. 583198	3865	3. 587149
3796	3. 579326	3831	3. 583312	3866	3. 587261
3797	3. 579440	3832	3. 583425	3867	3. 587374
3798	3. 579515	3833	3. 583538	3868	3. 587486
3799	3. 579669	3834	3. 583652	3869	3. 587598
3800	3. 579783	3835	3. 583765	3870	3. 587711
3801	3. 579897	3836	3. 583878	3871	3. 587823
3802	3. 580012	3837	3. 583991	3872	3. 587935
3803	3. 580126	3838	3. 584105	3873	3. 588047
3804	3. 580240	3839	3. 584218	3874	3. 588159
3805	3. 580354	3840	3. 584331	3875	3. 588271
3806	3. 580468	3841	3. 584444	3876	3. 588383
3807	3. 580582	3842	3. 584557	3877	3. 588495
3808	3. 580696	3843	3. 584670	3888	3. 588607
3809	3. 580811	3844	3. 584783	3879	3. 588719
3810	3. 580925	3845	3. 584896	3880	3. 588831
3811	3. 581038	3846	3. 585009	3881	3. 588943
3812	3. 581152	3847	3. 585122	3882	3. 589055
3813	3. 581266	3848	3. 585234	3883	3. 489167
3814	3. 581380	3849	3. 585347	3884	3. 589279
3815	3. 581494	3850	3. 585460	3885	3. 589391

Num	Logarith.	Num	Logarith.	Num	Logarith.
3886	3. 589502	3921	3. 593396	3956	3. 597256
3887	3. 589614	3922	3. 593507	2957	3. 597366
3888	3. 589726	3923	3. 593618	3958	3. 597475
3889	3. 589837	3924	3. 593729	3959	3. 597585
3890	3. 589949	3925	3. 593838	3960	3. 597695
3891	3. 590061	3926	3. 593950	3961	3. 597804
3892	3. 590172	3927	3. 594060	3962	3. 597914
3893	3. 590284	3928	3. 594171	3963	3. 598024
3894	3. 590395	3929	3. 594282	3964	3. 598133
3895	3. 590507	3930	3. 594392	3965	3. 598242
3896	3. 590618	3931	3. 594503	3966	3. 598352
3897	3. 590730	3932	3. 594613	3967	3. 598462
3898	3. 590841	3933	3. 594723	3968	3. 598571
3899	3. 590953	3934	3. 594834	3969	3. 598681
3900	3. 591064	3935	3. 594944	3970	3. 598790
3901	3. 591175	3936	3. 595055	3971	3. 598899
3902	3. 591287	3937	3. 595165	3972	3. 599006
3903	3. 591398	3938	3. 595275	3973	3. 599118
3904	3. 591509	3939	3. 595386	3974	3. 599227
3905	3. 591621	3940	3. 595496	3975	3. 599337
3906	3. 591732	3941	3. 595606	3976	3. 599446
3907	3. 591843	3942	3. 595716	3977	3. 599555
3908	3. 591954	3943	3. 595826	3978	3. 599664
3909	3. 592065	3944	3. 595936	3979	3. 599773
3910	3. 592176	3945	3. 596047	3980	3. 599883
3911	3. 592287	3946	3. 596157	3981	3. 599992
3912	3. 592398	3947	3. 596267	3982	3. 600101
3913	3. 592409	3948	3. 596377	3983	3. 600210
3914	3. 592620	3949	3. 596487	3984	3. 600319
3915	3. 592731	3950	3. 596597	3985	3. 600428
3916	3. 592842	3951	3. 596707	3986	3. 600537
3917	3. 592953	3952	3. 596816	3987	3. 600646
3918	3. 593064	3953	3. 596926	3988	3. 600755
3919	3. 593175	3954	3. 597036	3989	3. 600864
3920	3. 593286	3955	3. 597146	3990	3. 600972

Num	Logarith.	Num	Logarith.	Num	Logarith.
3991	3.601081	4026	3.604873	4061	3.608633
3992	3.601190	4027	3.604981	4062	3.608739
3993	3.601299	4028	3.605089	4063	3.608846
3994	3.601408	4029	3.605197	4064	3.608952
3995	3.601516	4030	3.605305	4065	3.609060
3996	3.601625	4031	3.605412	4066	3.609167
3997	3.601734	4032	3.605520	4067	3.609274
3998	3.601842	4033	3.605628	4068	3.609380
3999	3.601961	4034	3.605735	4069	3.609487
4000	3.602060	4035	3.605843	4070	3.609594
4001	3.602168	4036	3.605951	4071	3.609701
4002	3.602277	4037	3.606058	4072	3.609807
4003	3.602385	4038	3.606166	4073	3.609914
4004	3.602494	4039	3.606273	4074	3.610021
4005	3.602602	4040	3.606381	4075	3.610127
4006	3.602710	4041	3.606488	4076	3.610234
4007	3.602819	4042	3.606596	4077	3.610340
4008	3.602927	4043	3.606703	4078	3.610447
4009	3.603036	4044	3.606811	4079	3.610553
4010	3.603144	4045	3.606918	4080	3.610660
4011	3.603252	4046	3.607025	4081	3.610766
4012	3.603360	4047	3.607133	4082	3.610873
4013	3.603469	4048	3.607240	4083	3.610979
4014	3.603577	4049	3.607347	4084	3.611085
4015	3.603685	4050	3.607455	4085	3.611192
4016	3.603793	4051	3.607562	4086	3.611298
4017	3.603901	4052	3.607669	4087	3.611404
4018	3.604009	4053	3.607776	4088	3.611501
4019	3.604118	4054	3.607883	4089	3.611617
4020	3.604226	4055	3.607990	4090	3.611723
4021	3.604334	4056	3.608097	4091	3.611829
4022	3.604442	4057	3.608205	4092	3.611935
4023	3.604550	4058	3.608312	4093	3.612041
4024	3.604658	4059	3.608419	4094	3.612147
4025	3.604765	4060	3.608526	4095	3.612253

Num	Logarith.	Num	Logarith.	Num	Logarith.
4096	3.612359	4131	3.616055	4166	3.619719
4097	3.612466	4132	3.616160	4167	3.619823
4098	3.612572	4133	3.616265	4168	3.619927
4099	3.612677	4134	3.616370	4169	3.620031
4100	3.612783	4135	3.616475	4170	3.620136
4101	3.612889	4136	3.616580	4171	3.620240
4102	3.612995	4137	3.616685	4272	3.620344
4103	3.613101	4138	3.616790	4173	3.620448
4104	3.613207	4139	3.616895	4174	3.620552
4105	3.613313	4140	3.617000	4175	3.620656
4106	3.613418	4141	3.617105	4170	3.620760
4107	3.613524	4142	3.617210	4177	3.620864
4108	3.613630	4143	3.617314	4178	3.620968
4109	3.613736	4144	3.617419	4179	3.621072
4110	3.613841	4145	3.617524	4180	3.621176
4111	3.613947	4146	3.617629	4181	3.621280
4112	3.614053	4147	3.617734	4182	3.621384
4113	3.614158	4148	3.617838	4183	3.621487
4114	3.614264	4149	3.617943	4184	3.621591
4115	3.614369	4150	3.618048	4185	3.621695
4116	3.614475	4151	3.618152	4180	3.621799
4117	3.614580	4152	3.618257	4187	3.621903
4118	3.614686	4153	3.618361	4188	3.622006
4119	3.614791	4154	3.618466	4189	3.622110
4120	3.614897	4155	3.618571	4190	3.622214
4121	3.615002	4156	3.618675	4191	3.622317
4122	3.615108	4157	3.618780	4182	3.622421
4123	3.615213	4158	3.618884	4193	3.622524
4124	3.615318	4159	3.618988	4194	3.622628
4125	3.615424	4160	3.619093	4195	3.622732
4126	3.615529	4161	3.619197	4196	3.622835
4127	3.615634	4162	3.619302	4197	3.622939
4128	3.615739	4163	3.619406	4193	3.623042
4129	3.615844	4164	3.619510	4199	3.623145
4130	3.615950	4165	3.619615	4200	3.623249

Num	Logarith.	Num	Logarith.	Num	Logarith.
4201	3.623352	4236	3.626955	4271	3.630529
4202	3.623456	4237	3.627058	4272	3.630631
4203	3.623559	4238	3.627161	4273	3.630732
4204	3.623662	4239	3.627263	4274	3.630834
4205	3.623766	4240	3.627365	4275	3.630937
4206	3.623869	4241	3.627468	4276	3.631038
4207	3.623972	4242	3.627570	4277	3.631139
4208	3.624075	4243	3.627673	4278	3.631240
4209	3.624178	4244	3.627775	4279	3.631342
4210	3.624282	4245	3.627877	4280	3.631443
4211	3.624385	4246	3.627980	4281	3.631545
4212	3.624488	4247	3.628082	4282	3.631646
4213	3.624591	4248	3.628184	4283	3.631748
4214	3.624694	4249	3.628286	4284	3.631849
4215	3.624797	4250	3.628388	4285	3.631950
4216	3.624900	4251	3.628491	4286	3.632052
4217	3.625003	4252	3.628593	4287	3.632153
4218	3.625106	4253	3.628695	4288	3.632254
4219	3.625209	4254	3.628797	4289	3.632356
4220	3.625312	4255	3.628899	4290	3.632457
4221	3.625415	4256	3.629001	4291	3.632558
4222	3.625518	4257	3.629103	4292	3.632659
4223	3.625621	4258	3.629205	4293	3.632760
4224	3.625723	4259	3.629307	4294	3.632862
4225	3.625826	4260	3.629409	4295	3.632963
4226	3.626929	4261	3.629511	4296	3.633064
4227	3.626032	4262	3.629613	4297	3.633165
4228	3.626135	4263	3.629715	4298	3.633266
4229	3.626237	4264	3.629817	4299	3.633367
4230	3.626340	4265	3.629919	4300	3.633468
4231	3.626443	4266	3.630020	4301	3.633569
4232	3.626545	4267	3.630122	4302	3.633670
4233	3.626648	4268	3.630224	4303	3.633771
4234	3.626750	4269	3.630326	4304	3.633872
4235	3.626853	4270	3.630427	4305	3.633973

Num	Logarith.	Num	Logarith.	Num	Logarith.
4306	3.634074	4341	3.637589	4376	3.641077
4307	3.634174	4342	3.637689	4377	3.641176
4308	3.634275	4343	3.537789	4378	3.641275
4309	3.634376	4344	3.637889	4379	3.641374
4310	3.634477	4345	3.637989	4380	3.641474
4311	3.634578	4346	3.638089	4381	3.641573
4312	3.634678	4347	3.638189	4382	3.641672
4313	3.634779	4348	3.638289	4383	3.641771
4314	3.634880	4349	3.638389	4384	3.641870
4315	3.634980	4350	3.638489	4385	3.941969
4316	3.635081	4351	3.638589	4386	3.642068
4317	3.635182	4352	3.638688	4387	3.642167
4318	3.635282	4353	3.638788	4388	3.642266
4319	3.635383	4354	3.638888	4389	3.642365
4320	3.635483	4355	3.638988	4390	3.642464
4321	3.635584	4356	3.639087	4391	3.642563
4322	3.635684	4357	3.639187	4392	3.642662
4323	3.635785	4358	3.639287	4393	3.642761
4324	3.635885	4359	3.639386	4394	3.642860
4325	3.635986	4360	3.639486	4395	3.642958
4326	3.636086	4361	3.639586	4396	3.643057
4327	3.636186	4362	3.639685	4397	3.643156
4328	3.636287	4363	3.639785	4398	3.643255
4329	3.636387	4364	3.639884	4399	3.643354
4330	3.636487	4365	3.639984	4400	3.643452
4331	3.636588	4366	3.640083	4401	3.643551
4332	3.636688	4367	3.640183	4402	3.643650
4333	3.636788	4368	3.640282	4403	3.643748
4334	3.636888	4369	3.640382	4404	3.643847
4335	3.636989	4370	3.640481	4405	3.643945
4336	3.637089	4371	3.640580	4406	3.644044
4337	3.637189	4372	3.640680	4407	3.644143
4338	3.637289	4373	3.640779	4408	3.644241
4339	3.637389	4374	3.640878	4409	3.644340
4340	3.637489	4375	3.640978	4410	3.644438

Num	Logarith.	Num	Logarith.	Num	Logarith.
4411	3.644537	4446	3.647969	4481	3.651375
4412	3.644635	4447	3.648067	4482	3.651471
4413	3.644733	4448	3.648164	4483	3.651568
4414	3.644832	4449	3.648262	4484	3.651665
4415	3.644930	4450	3.648360	4485	3.651762
4416	3.645029	4451	3.648457	4480	3.651859
4417	3.645127	4452	3.648555	4487	3.651956
4418	3.645225	4453	3.648652	4488	3.652052
4419	3.645324	4454	3.648750	4489	3.652149
4420	3.645422	4455	3.648847	4490	3.652246
4421	3.645520	4456	3.648945	4491	3.652343
4422	3.645618	4457	3.649042	4492	3.652439
4423	3.645716	4458	3.649140	4493	3.652536
4424	3.645815	4459	3.649237	4494	3.652633
4425	3.645913	4460	3.649334	4495	3.652729
4426	3.646011	4461	3.649432	4496	3.652826
4427	3.646109	4462	3.649529	4497	3.652922
4428	3.646207	4463	3.649626	4498	3.653019
4429	3.646305	4464	3.649724	4499	3.653116
4430	3.646403	4465	3.649821	4500	3.653212
4431	3.646501	4466	3.649918	4501	3.653309
4432	3.646599	4467	3.650016	4502	3.653405
4433	3.646697	4468	3.650113	4503	3.653591
4434	3.646795	4469	3.650210	4504	3.653598
4435	3.646893	4470	3.650307	4505	3.653694
4436	3.646991	4471	3.650404	4506	3.653791
4437	3.647089	4472	3.650501	4507	3.653887
4438	3.647187	4473	3.650598	4508	3.653983
4439	3.647285	4474	3.650696	4509	3.654080
4440	3.647383	4475	3.650793	4510	3.654176
4441	3.647480	4476	3.650890	4511	3.654272
4442	3.647578	4477	3.650997	4512	3.654369
4443	3.647676	4478	3.651084	4513	3.654465
4444	3.647774	4479	3.651181	4514	3.654561
4445	3.647871	4480	3.651278	4515	3.654657

Num	Logarith.	Num	Logarith.	Num	Logarith.
4516	3.654753	4551	3.658105	4586	3.661434
4517	3.654850	4552	3.658202	4587	3.661528
4518	3.654946	4553	3.658297	4588	3.661623
4519	3.655042	4554	3.658393	4589	3.661718
4520	3.655138	4555	3.658488	4590	3.661812
4521	3.655230	4556	3.658583	4591	3.661907
4522	3.655334	4557	3.658679	4592	3.662001
4523	3.655426	4558	3.658774	4593	3.662096
4524	3.655522	4559	3.658869	4594	3.662191
4525	3.655618	4560	3.658964	4595	3.662285
4526	3.655714	4561	3.659060	4596	3.662380
4527	3.655810	4562	3.659155	4596	3.662474
4528	3.655906	4563	3.659250	4597	3.662569
4529	3.656002	4564	3.659345	4598	3.662663
4530	3.656098	4565	3.659440	4600	3.662757
4531	3.656194	4566	3.659535	4601	3.662852
4532	3.656289	4567	3.659631	4602	3.662946
4533	3.656385	4568	3.659726	4603	3.663041
4534	3.656481	4569	3.659821	4604	3.663135
4535	3.656577	4570	3.659916	4605	3.663229
4536	3.656673	4571	3.660101	4606	3.663323
4537	3.656768	4572	3.660106	4607	3.663418
4538	3.656864	4573	3.660201	4608	3.663512
4539	3.656969	4574	3.660296	4609	3.663606
4540	3.657055	4575	3.660391	4610	3.663700
4541	3.657151	4576	3.660486	4611	3.663795
4542	3.657247	4577	3.660580	4612	3.663889
4543	3.657342	4578	3.660675	4613	3.663983
4544	3.657438	4579	3.660770	4614	3.664077
4545	3.657532	4580	3.660865	4615	3.664171
4546	3.657629	4581	3.660960	4616	3.664265
4547	3.657725	4582	3.661055	4617	3.664359
4548	3.657820	4583	3.661149	4618	3.664453
4549	3.657915	4584	3.661244	4619	3.664548
4550	3.658011	4585	3.661339	4620	3.664642

Num	Logarithm.	Num	Logarithm.	Num	Logarithm.
4621	3.664736	4656	3.668013	4691	3.671265
4622	3.664829	4657	3.668106	4692	3.671335
4623	3.664923	4658	3.668199	4693	3.671475
4624	3.665017	4659	3.668292	4694	3.671554
4625	3.665111	4660	3.668385	4695	3.671663
4626	3.665205	4661	3.668479	4696	3.671728
4627	3.665299	4662	3.668572	4697	3.671820
4628	3.665393	4663	3.698665	4698	3.671913
4629	3.665487	4664	3.668758	4699	3.672005
4630	3.665581	4665	3.668851	4700	3.672097
4631	3.665674	4666	3.668944	4701	3.672190
4632	3.665768	4667	3.669037	4702	3.672282
4633	3.665862	4668	3.669130	4703	3.672375
4634	3.665956	4669	3.669223	4704	3.672467
4635	3.666049	4670	3.669316	4705	3.672559
4636	3.666143	4671	3.669409	4706	3.672651
4637	3.666237	4672	3.669502	4707	3.672744
4638	3.666330	4673	3.669595	4708	3.672836
4639	3.666424	4674	3.669688	4709	3.672928
4640	3.666518	4675	3.669781	4710	3.673020
4641	3.666611	4676	3.669874	4711	3.673113
4642	3.666705	4877	3.669967	4712	3.673265
4643	3.666798	4678	3.670060	4713	3.673297
4644	3.666892	4679	3.670153	4714	3.673389
4645	3.666985	4680	3.670245	4715	3.673481
4646	3.667079	4681	3.670338	4716	3.673573
4647	3.667172	4682	3.670431	4717	3.673665
4648	3.667266	4683	3.670524	4718	3.673757
4649	3.667359	4684	3.670616	4719	3.673850
4650	3.667453	4685	3.670700	4720	3.673942
4651	3.667546	4686	3.670802	4321	3.674034
4652	3.667639	4687	3.670895	4722	3.674126
4653	3.667733	4688	3.670987	4723	3.674217
4654	3.667826	4689	3.671080	4724	3.674309
4655	3.667919	4690	3.671172	4725	3.674401

Num	Logarith.	Num	Logarith.	Num	Logarith.
4726	3.674493	4761	3.677698	4796	3.680879
4727	3.674585	4762	3.677789	4797	3.680969
4728	3.674677	4763	3.677880	4798	3.681060
4729	3.674769	4764	3.677971	4799	3.681150
4730	3.674861	4765	3.678062	4800	3.681241
4731	3.674952	4766	3.678154	4801	3.681331
4732	3.675044	4767	3.678245	4802	3.681422
4733	3.675136	4768	3.678336	4803	3.681512
4734	3.675228	4769	3.678427	4804	3.681603
4735	3.675320	4770	3.678518	4805	3.681693
4736	3.675411	4771	3.678609	3806	3.681783
4737	3.675503	4772	3.678700	4807	3.681874
4738	3.675595	4773	3.678791	4808	3.681964
4739	3.675686	4774	3.678882	4809	3.682054
4740	3.675778	4775	3.678973	4810	3.682145
4741	3.675870	4776	3.679064	4811	3.682235
4742	3.675961	4777	3.679155	4812	3.682325
4743	3.676053	4778	3.679246	4813	3.682405
4744	3.676144	4779	3.679337	4814	3.682516
4745	3.676236	4780	3.679427	4815	3.682596
4746	3.676327	4781	3.679518	4816	3.682686
4747	3.676419	4782	3.679609	4817	3.682776
4748	3.676510	4783	3.679700	4818	3.682866
4749	3.676602	4784	3.679790	4819	3.682956
4750	3.676693	4785	3.679881	4820	3.683047
4751	3.676785	4786	3.679972	4821	3.693137
4752	3.676876	4787	3.680063	4822	3.683227
4753	3.676967	4788	3.680154	4823	3.683317
4754	3.677059	4789	3.680244	4824	3.683407
4755	3.677150	4790	3.680335	4825	3.683497
4756	3.677241	4791	3.680426	4826	3.683567
4757	3.677333	4792	3.680516	4827	3.683677
4758	3.677424	4793	3.680607	4828	3.683767
4759	3.677515	4794	3.680698	4829	3.683857
4760	3.677606	4795	3.680788	4830	3.683947

Num	Logarith.	Num	Logarith.	Num	Logarith.
4831	3.684037	4866	3.687172	4901	3.690284
4832	3.684126	4867	3.687261	4902	3.690373
4833	3.684216	4868	3.687350	4903	3.690461
4834	3.684306	4869	3.687439	4904	3.690550
4835	3.684396	4870	3.687529	4905	3.690638
4836	3.684486	4871	3.687618	4906	3.690727
4937	3.684576	4872	3.687707	4907	3.690816
4838	3.684665	4873	3.687796	4908	3.690904
4839	3.684755	4874	3.687885	4909	3.690993
4840	3.684845	4875	3.687974	4910	3.691081
4841	3.684935	4876	3.688063	4911	3.691169
4842	3.685024	4877	3.688152	4912	3.691258
4843	3.685114	4878	3.688242	4913	3.691346
4844	3.685204	4879	3.688330	4914	3.691435
4845	3.685293	4880	3.688419	4915	3.691523
4846	3.685383	4881	3.688508	4916	3.691611
4847	3.685473	4882	3.688597	4917	3.691700
4848	3.685562	4883	3.688686	4918	3.691788
4849	3.685652	4884	3.688775	4919	3.691876
4850	3.685741	4885	3.688864	4920	3.691965
4851	3.685831	4886	3.688953	4921	3.692053
4852	3.685920	4887	3.689042	4922	3.692141
4853	3.686010	4888	3.689131	4923	3.692229
4854	3.686089	4889	3.689220	4924	3.692318
4855	3.686199	4890	3.689308	4925	3.692406
4856	3.686278	4891	3.689397	4926	3.692494
4857	3.686368	4892	3.689486	4927	3.692582
4858	3.686457	4893	3.689575	4928	3.692670
4859	3.686546	4894	3.689664	4929	3.692758
4860	3.686636	4895	3.689752	4930	3.692846
4861	3.686725	4896	3.689841	4931	3.692935
4862	3.686814	4897	3.689930	4932	3.693023
4863	3.686904	4898	3.690018	4933	3.693111
4864	3.686993	4899	3.690107	4934	3.693199
4865	3.687082	4900	3.690196	4935	3.693287

Num	Logarith.	Num	Logarith.	Num	Logarith.
4936	3.693375	4971	3.696443	5006	3.699490
4937	3.693463	4972	3.696531	5007	3.699577
4938	3.963551	4983	3.696618	4008	3.699664
4939	3.963639	4974	3.696705	5009	3.699751
4940	3.663726	4975	3.696793	5010	3.699837
4941	3.693814	4976	3.696880	5011	3.699924
4942	3.693902	4977	3.696967	5012	3.700011
4943	3.593990	4978	3.697054	5013	3.700097
4944	3.694078	4979	3.697142	5014	3.700184
4945	3.694166	4980	3.697229	5015	3.700270
4946	3.694254	4981	3.697316	5016	3.700357
4947	3.694341	4982	3.697403	5017	3.700444
4948	4.694429	4983	3.697490	5018	3.700530
4949	3.694517	4984	3.697578	5019	3.700617
4950	3.694605	4985	3.697665	5020	3.700709
4951	3.694692	4986	3.697752	5021	3.700790
4952	3.694780	4887	3.697839	5022	3.700876
4953	3.694868	4988	3.697926	5023	3.700963
4954	3.694956	4989	3.798013	5024	3.701049
4955	3.695043	4990	3.698100	5025	3.701136
4956	3.695131	4991	3.698187	5026	3.701222
4957	3.695218	4992	3.698274	5027	3.701398
4958	3.695306	4993	3.698361	5028	3.701395
4959	3.695394	4994	3.698448	5029	3.701481
4960	3.695481	4995	3.698535	5030	3.701568
4961	3.695569	4996	3.698622	5031	3.701654
4962	3.695656	4997	3.698709	5032	3.701740
4963	3.695744	4998	3.698796	5033	3.701826
4964	3.695831	4999	3.698883	5034	3.701913
4965	3.695919	5000	3.698970	5035	3.701994
4966	3.696006	5001	3.699056	5036	3.702085
4967	3.696094	5002	3.699143	5037	3.702171
4968	3.696181	5003	3.699230	5038	3.702258
4969	3.696269	5004	3.699317	5039	3.702344
4970	3.696356	5005	3.699404	5040	3.702430

Num	Logarith.	Num	Logarith.	Num	Logarith
5041	3.702516	5076	3.705521	5111	3.708505
5042	3.702602	5077	3.705607	5112	3.708590
5043	3.702689	5078	3.705692	5113	3.708675
5044	3.702775	5079	3.705778	5114	3.708760
5045	3.702861	5080	3.705862	4115	3.708845
5046	3.702947	5081	3.705949	5116	3.708930
5047	3.703033	5082	3.706033	5117	3.709015
5048	3.703119	5083	3.706120	5118	3.709100
5049	3.703205	5084	3 706205	5119	3.709185
5050	3.703291	5085	3.706291	5120	3.709270
5051	3.703291	5086	3.706376	5121	3.709354
5052	3.703377	5087	3.706461	5122	3.709439
5053	3.703463	5088	3.706547	5123	3.709524
5054	3.703549	5089	3.706632	5124	3.709609
5055	3.703635	5090	3.706717	5125	3.709693
5056	3.703807	5091	3.706803	5126	3.709778
5057	3.704892	5092	3.706888	5127	3.709863
5058	3.703978	5093	3.706973	5128	3.709948
5059	3.704064	5094	3.707058	5129	3.710032
5060	3.704150	5095	3.707144	5130	3.710117
5061	3.704236	5096	3.707229	5131	3.710202
5062	3.704322	5097	3.707314	5132	3.710286
5063	3.704407	5098	3.707399	5133	3.710371
5064	3.704493	5099	3.707485	5134	3.710455
5065	3.704579	5100	3.707570	5135	3.710540
5066	3.704665	5101	3.707655	5136	3.710625
5067	3.704750	5102	3.707740	5137	3.710709
5068	3.704836	5103	3.707825	5138	3.710794
5069	3.704922	5104	3.707910	5139	3.710878
5070	3.705008	5105	3.707995	5140	3.710963
5071	3.705093	5106	3.708080	5141	3.711047
5072	3.705179	5107	3.708165	5142	3.711132
5073	3.705264	5108	3.708250	5143	3.711216
5074	3.705350	5109	3.708335	5144	3.711301
5075	3.705436	5110	3.708420	5145	3.711385

Num	Logarith	Num	Logarith.	Num	Logarith.
5146	3.711469	5181	3.714413	5216	3.717337
5147	3.711554	5182	3.714497	5217	3.717420
5148	3.711638	5183	3.714581	5218	3.717504
5149	3.711722	5184	3.714665	5219	3.717587
5150	3.711807	5185	3.714748	5220	3.717670
5151	3.711891	5186	3.714832	5221	3.717753
5152	3.711975	5187	3.714016	5222	3.717836
5153	3.712060	5188	3.715000	5223	3.717920
5154	3.712144	5189	3.715083	5224	3.718003
5155	3.712228	5190	3.715167	5225	3.718086
5156	3.712312	5191	3.715251	5226	3.718169
5157	3.712397	5192	3.715334	5227	3.718252
5258	3.712481	5193	3.715418	5228	3.718335
5159	3.712565	5194	3.718501	6229	3.718418
5160	3.712649	5195	3.715585	5230	3.718501
5161	3.712733	5196	3.715669	5231	3.718584
6162	3.711818	5197	3.715752	5232	3.718667
5163	3.712902	5198	3.715836	5233	3.718750
5164	3.712986	5199	3.715919	9234	3.718833
5165	3.713070	5200	3.716003	5235	3.718916
5166	3.713154	5201	3.716086	5236	3.718999
5167	3.713238	5202	3.716170	5237	3.719082
5168	3.713322	5203	3.716253	5238	3.719165
5169	3.713406	5204	3.716337	5239	3.719248
5170	3.713490	5205	3.716420	5240	3.719331
5171	3.713574	5206	3.716504	5241	3.719414
5172	3.713658	5207	3.716587	5242	3.719497
5173	3.713742	5208	3.716671	5243	3.719579
5174	3.713826	5209	3.716754	5244	3.719662
5175	3.713910	5210	3.716837	5245	3.719745
5176	3.713994	5211	3.716921	5246	3.719828
5177	3.714078	5212	3.717004	5247	3.719911
5178	3.714162	5213	3.717087	5248	3.719993
5179	3.714245	5214	3.717171	5249	3.710076
5180	3.714329	5215	3.717254	5250	3.710159

Num	Logarith.	Num	Logarith.	Num	Logarith.
5251	3.720242	5286	3.723127	5321	3.725993
5252	3.720324	5287	3.723209	5322	3.726074
5253	3.720407	5288	3.723291	5323	3.726156
5254	3.720490	5289	3.723373	5324	3.726238
5255	3.720572	5290	3.723455	5325	3.726319
5256	3.720655	5291	3.723537	5326	3.726401
5257	3.720738	5292	3.723619	5327	3.726482
5258	3.720820	5293	3.723701	5328	3.726564
5259	3.720903	5294	3.723783	5329	3.726645
5260	3.720985	5295	3.723866	5330	3.726727
5261	3.721068	5296	3.723948	5331	3.726808
5262	3.721150	5297	3.724030	5332	3.726890
5263	3.721233	5298	3.724112	5333	3.726971
5264	3.721315	5299	3.724193	5334	3.727053
5265	3.721398	5300	3.724275	5335	3.727134
5266	3.721480	5301	3.724357	5336	3.727215
5267	3.721563	5302	3.724439	5337	3.727297
5268	3.721645	5303	3.724521	5338	3.727378
5269	3.721728	5304	3.724603	5339	4.727459
5270	3.721810	5305	3.724685	5340	3.727541
5271	3.721893	5306	3.724767	5341	3.727622
5272	3.721975	5307	3.724849	5342	3.727703
5273	3.722057	5308	3.724930	5343	3.727785
5274	3.722140	5309	3.725012	5344	3.727866
5275	3.722222	5310	3.725094	5345	3.727947
5276	3.722304	5311	3.725176	5346	3.728029
5277	3.722387	5312	3.725258	5347	3.728110
5278	3.722469	5313	3.725339	5348	3.728191
5279	3.722551	5314	3.725421	5349	3.728272
5280	3.722633	5315	3.825503	5350	3.728353
5281	3.722716	5316	3 725585	5351	3.728434
5282	3.722798	5317	3.725666	5352	3.728516
5283	3.722880	5318	3.725748	5353	3.728597
5284	3.722962	5319	3.725830	5354	3.728678
5285	3.723045	5320	3.725911	5355	3.728759

Num	Logarithn.	Num	Logarith	Num	Logarith.
5356	3.728840	5391	3.731669	5426	3.734479
5357	3.728921	5392	3.731749	5427	3.734559
5358	3.729002	5393	3.731830	5428	3.734639
5359	3.729083	5394	3.731910	5429	3.734719
5360	3.729164	5395	3.731991	5430	3.734799
5361	3.729245	5396	3.732071	5431	3.734879
5362	3.729326	5397	3.732152	5432	3.734959
5363	3.729407	5398	3.732232	5433	3.735039
5364	3.729488	5399	3.732313	5434	3.735119
5365	3.729569	5400	3.732393	5435	3.735199
5366	3.729650	5401	3.732474	5436	3.735279
5367	3.729731	5402	3.732554	5437	3.735359
5368	3.729812	5403	3.732635	5438	3.735439
5369	3.729893	5404	3.732715	5439	3.735519
5370	3.729974	5405	3.732795	5440	3.735598
5371	3.730055	5406	3.732876	5441	3.735678
5372	3.730136	5407	3.732956	5442	3.735758
5373	3.730216	5408	3.733036	5443	3.735838
5374	3.730297	5409	3.733117	5444	3.735918
5375	3.730378	5410	3.733197	5445	3.735997
5376	3.730459	5411	3.733277	5446	3.736077
5377	3.730540	5412	3.133357	5447	3.736157
5378	3.730620	5413	3.733438	5448	3.936237
5379	3.730701	5414	3.733518	5449	3.736316
5380	3.730782	5415	3.733598	5450	3.736396
5381	3.730863	5416	3.733678	5451	3.736476
5382	3.730943	5417	3.733758	5452	3.736555
5383	3.731024	5418	3.733839	5453	3.736635
5384	3.731105	5419	3.733919	5454	3.736715
5385	3.731185	5420	3.733999	5455	3.736794
5386	3.731266	5421	3.734079	5456	3.736874
5387	3.731347	5422	3.734159	5457	3.736954
5388	3.731427	5423	3.734239	5458	3.737033
5389	3.731508	5424	3.734319	5459	3.737113
5390	3.731588	5425	3.734399	5460	3.737192

Num	Logarith.	Num	Logarith.	Num	Logarith.
5461	3.737272	5496	3.740046	5531	3.742803
5462	3.737351	5497	3.740125	5532	3.742882
5463	3.737431	5498	3.740204	5553	3.742960
5464	3.737510	5499	3.740283	5534	3.743039
5465	3.737500	5500	3.740362	5535	3.743117
5466	3.737669	5501	3.740441	5539	3.743196
5467	3.737749	5502	3.740520	5537	3.743274
5468	3.737828	5503	3.740599	5538	3.743353
5469	3.737907	5504	3.740678	5539	3.743431
5470	3.737987	5505	3.740757	5540	3.743509
5471	3.738000	5506	3.740836	5541	3.743588
5472	3.738146	5507	3.740915	5542	3.743666
5473	3.738225	5508	3.740093	5543	3.743744
5474	3.738304	5509	3.741072	5544	3.743823
5475	3.738384	5510	3.741151	5545	3.743901
5476	3.738463	5511	3.741230	5566	3.743979
5477	3.738542	5512	3.741309	5547	3.744058
5478	3.738622	5513	3.741388	5548	3.744136
5479	3.738701	5514	3.741466	5549	3.744214
5480	3.738780	5515	3.741545	5550	3.744293
5481	3.738859	5516	3.741624	5551	3.744371
5482	3.738939	5517	3.731703	5552	3.744449
5483	3.739018	5518	3.741781	5553	3.744527
5484	3.739097	5519	3.741860	5554	3.744605
5485	3.739176	5520	3.741939	5555	3.744684
5486	3.739255	5521	3.742017	5556	3.744762
5487	3.739335	5522	3.742096	5557	3.744840
5488	3.739414	5523	3.742175	5558	3.744918
5489	3.739493	5524	3.742253	5559	3.744996
5490	3.739572	5525	3.742332	5560	3.745074
5491	3.739681	5526	3.742410	5561	3.745152
5492	3.739730	5527	3.742489	5562	3.745231
5493	3.739809	5528	3.742568	5563	3.745309
5494	3.739888	5529	3.742646	5564	3.745387
5495	3.739867	5530	3.742725	5565	3.745465

Num	Logarith.	Num	Logarith.	Num	Logarith.
5566	3.745543	5601	3.748265	5636	3.750970
5567	3.745621	5602	3.748343	5637	3.751048
5568	3.745699	5603	3.748420	5638	3.751125
5569	3.745777	5604	3.748498	5639	3.751202
5570	3.745855	5605	3.748575	5640	3.751279
5571	3.745933	5606	3.748653	5641	3.751356
5572	3.746011	5607	3.748730	5642	3.751433
5573	3.746089	5608	3.748808	5643	3.751510
0574	3.746167	5609	3.848885	5644	3.751587
5575	3.746244	5610	3.748962	5645	3.751663
5576	3.746322	5611	3.749040	5646	3.751740
5577	3.756400	5612	3.749117	5647	3.751817
6578	3.746478	5613	3.749195	5648	3.751894
5579	3.746556	5614	3.749272	5649	3.751971
5580	3.746634	5615	3.749349	5650	3.752048
5581	3.746712	5616	3.749427	5651	3.752125
5582	3.746789	5617	3.749504	5652	3.752202
5593	3.746867	5618	3.749581	5653	3.752279
5584	3.746945	5619	3.749659	5654	3.752355
5585	3.747023	5620	3.749736	5655	3.752432
5586	3.747100	5621	3.749813	5656	3.752509
5587	3.745178	5622	3.749890	5657	3.752586
5588	3.747256	5623	3.749988	5658	3.752662
5589	3.747334	5624	3.750045	5659	3.752739
5590	3.747411	5625	3.750122	5660	3.752816
5591	3.747489	5626	3.750199	5661	3.752893
5592	3.747567	5627	3.750276	5662	3.752969
5593	3.747644	5628	3.750354	5663	3.753046
5594	3.847722	5629	3.750431	5664	3.753123
5595	3.747800	5630	3.750508	5665	3.753199
5596	3.747877	5631	3.750585	5666	3.753276
5597	3.747955	5632	3.750662	5667	3.753353
5598	3.748032	5633	3.750739	5668	3.753429
5599	3.742110	5634	3.750816	5669	3.753506
5600	3.748188	5635	3.750893	5670	3.753583

Num	Logarith.	Num	Logarith.	Num	Logarith.
5671	3.753659	5706	3.756331	5741	3.758987
5672	3.753736	5707	3.756407	5742	3.759063
5673	3.753812	5708	3.756484	5743	3.759138
5674	3.753889	5709	3.756560	5744	3.759214
5675	3.753965	5710	3.756636	5745	3.759290
5676	3.754042	5711	3.756712	5746	3.759365
5677	3.754118	5712	3.756788	5747	3.759441
5678	3.754195	5713	3.756864	5748	3.759516
5679	3.754271	5714	3.756940	5749	3.759592
5680	3.754348	5715	3.757016	5750	3.759667
5681	3.754424	5716	3.757092	5751	3.759743
5682	3.754501	5717	3.757168	5752	3.759818
5683	3.754577	5718	3.757244	5753	3.759894
5684	3.754654	5719	3.757320	6754	3.759969
5685	3.754730	5720	3.757396	5755	3.760045
5686	3.754806	5721	3.757471	5756	3.760120
5687	3.754883	5722	3.757547	5756	3.760196
5688	3.754959	5723	3.757623	5758	3.760277
5589	3.755035	5724	3.757699	5759	3.760341
5690	3.755112	5725	3.757775	5760	3.760422
5691	3.755188	5726	3.757851	5761	3.760497
5692	3.755264	5727	3.757927	5762	3.760573
5693	3.755341	5728	3.758003	5763	3.760648
5694	3.755417	5729	3.758078	5764	3.760724
5695	3.755493	5730	3.758154	5765	3.760799
5696	3.755570	5731	3.758230	5766	3.760874
5697	3.755646	5732	3.758306	5767	3.760950
5698	3.755722	5733	3.758381	5768	3.761025
5699	3.755798	5734	3.758457	5769	3.761100
5700	3.755874	5735	3.758533	5770	3.761175
5701	3.755951	5736	3.758609	5771	3.761251
5702	3.756027	5737	3.758684	5772	3.761326
5603	3.756103	5738	3.758760	5773	3.761401
5704	3.756179	5739	3.758836	5774	3.761456
5305	3.756255	5740	3.758911	5775	3.761552

Num	Logarith.	Num	Logarith.	Num	Logarith.
5776	3.761627	5811	3.764250	5846	3.765843
5777	3.761702	5812	3.764325	5847	3.765933
5778	3.761774	5813	3.764400	5848	3.767007
5779	3.761852	5814	3.764475	5849	3.767081
5780	3.761927	5815	3.764549	5850	3.767155
5781	3.762003	5816	3.764624	5851	3.767230
5782	3.762078	5817	3.764699	5852	3.767304
5783	3.762153	5818	3.764773	5853	3.767378
5784	3.762228	5819	3.764848	5854	3.767452
5785	3.762303	5820	3.764920	5855	3.757526
5786	3.762376	5821	3.764997	5856	3.767601
5787	3.762453	5822	3.765072	5857	3.797675
5788	3.762528	5823	3.765146	5858	3.767749
5789	3.762603	5824	3.765221	5859	3.767823
5790	3.762678	5825	3.755295	5860	3.767897
5791	3.762753	5826	3.765370	5861	3.767971
5792	3.762828	5827	3.765445	5862	3.768045
5793	3.762903	5828	3.765519	5863	3.768119
5794	3.762978	5829	3.765594	5864	3.768194
5795	3.763053	5830	3.765668	5865	3.768268
5796	3.763128	5831	3.765743	5866	3.768342
5797	3.763203	5732	3.765817	5867	3.768416
5798	3.763278	5833	3.765892	5868	3.768490
5799	3.763353	5834	3.765966	5869	3.768564
5800	3.763428	5835	3.766040	5870	3.768638
5801	3.763502	5836	3.766115	5871	3.768712
5802	3.763577	5837	3.766189	5872	3.768786
5803	3.763652	5838	3.766264	5873	3.763860
5804	3.763727	5839	3.766338	5874	3.768933
5805	3.763802	5840	3.766412	5875	3.769007
5806	3.763877	5841	3.766487	5876	3.759081
5807	3.763951	5842	3.766561	5877	3.769155
5808	3.764026	5843	3.766635	5878	3.769229
5809	3.764101	5844	3.766710	5879	3.769307
5810	3.764176	5845	3.766784	5880	3.759373

Num	Logarith.	Num	Logarith.	Num	Logarith.
5881	3.769451	5916	3.772028	5951	3.774589
5882	3.769525	5917	3.772101	5952	3.774662
5883	3.769598	5918	3.772175	5953	3.774735
5884	3.769672	5919	3.772248	5954	3.774808
5885	3.769746	5920	3.772321	5955	3.774881
5886	3.769820	5921	3.772395	5956	3.774954
5887	3.769894	5922	3.772468	5957	3.775027
5888	3.769967	5923	3.772541	5958	3.775100
5889	3.770041	5924	3.772615	5959	3.775173
5890	3.770115	5925	3.772688	5960	3.775246
5891	3.770189	5926	3.772761	5961	3.775319
5892	3.770262	5927	3.772834	5962	3.775393
5893	3.770336	5928	3.772908	5963	3.775464
5894	3.770410	5929	3.772981	5964	3.775537
5895	3.770483	5930	3.773054	5965	3.775610
5896	3.770557	5931	3.773127	5966	3.775683
5897	3.770631	5932	3.773201	5967	3.775756
5898	3.770704	5933	3.773274	5968	3.775828
5899	3.770778	5934	3.773347	5969	3.775901
5900	3.770852	5935	3.773420	5970	3.775974
5901	3.770925	5936	3.773493	5971	3.776047
5902	3.770999	5937	3.773567	5972	3.796119
5903	3.771542	5938	3.773640	5973	3.776192
5904	3.771176	5939	3.773713	5974	3.776265
5905	3.771219	5940	3.773786	5975	3.776237
5906	3.771293	5941	3.773859	5976	3.776410
5907	3.772467	5942	3.773932	5977	3.776483
5908	3.771440	5943	3.774005	5978	3.776551
5909	3.771514	5944	3.774078	5979	3.776928
5910	3.771587	5845	3.774151	5980	3.776701
5911	3.771661	5946	3.774224	5981	3.776673
5912	3.771734	5947	3.774297	5982	3.776846
5913	3.771807	5948	3.774371	5983	3.776919
5914	3.771880	5949	3.774444	5984	3.776992
5915	3.771954	5950	3.774517	5985	3.777064

Num	Logarith.	Num	Logarith.	Num	Logarith.
5986	3.777136	6021	3.779668	6056	3.782185
5987	3.777209	6022	3.779740	6057	3.782257
5988	3.777281	6023	3.779812	6058	3.782329
5989	3.777354	6024	3.779885	6059	3.782401
5990	3.777426	6025	3.779957	6060	3.782472
5991	3.777469	6026	3.780029	6061	3.782544
5992	3.777571	6027	3.780101	6062	3.782615
5983	3.777644	6028	3.780173	6063	3.782687
5994	3.777716	6029	3.780245	6064	3.782759
5995	3.777789	6030	3.780317	6065	3.782830
5996	3.777861	6031	3.780389	6066	3.782902
5997	3.777934	6032	3.780461	6067	3.782974
5998	3.778006	6033	3.780533	6068	3.783045
5999	3.778078	6034	3.780605	6069	3.783117
6000	3.778151	6035	3.780677	6070	3.783188
6001	3.778223	6036	3.780749	6071	3.783260
6002	3.778296	6037	3.780821	6072	3.783331
6003	3.778368	6038	4.780893	6073	3.783403
6004	3.778440	6039	3.780965	5074	3.783474
6005	3.774413	6040	3.781036	6075	3.783546
6006	3.778585	6041	3.781108	6076	3.783617
6007	3.778617	6042	3.781180	6077	3.783689
6008	3.778729	6043	3.781252	6078	3.783760
6009	3.778802	6044	3.781324	6074	3.783832
6010	3.778874	6045	3.781396	6080	3.783903
6011	3.778946	6046	3.781468	6081	3.783975
0012	3.779019	6047	3.781540	6082	3.784046
6013	3.779091	6048	3.781611	6083	3.784117
6014	3.779163	6049	3.781683	6084	5.784189
6015	3.799235	6050	3.781755	6085	3.784260
6016	3.779307	6051	3.781827	6085	3.784331
6017	3.779380	6052	3.781898	6087	3.784403
6018	3.779452	6053	3.781970	6088	3.784474
6019	3.779524	6054	3.782042	6089	3.784546
6020	3.779596	6055	3.782114	6090	3.784617

Num	Logarith	Num	Logarith.	Num	Logarith.
6091	3.784638	6136	3.787177	6161	3.789651
6092	3.784759	6127	3.787247	6162	3.789721
6093	3.794831	6128	3.787318	6163	3.789791
6094	3.784902	6129	3.787339	6164	3.789862
6065	3.784973	6130	3.787460	0165	3.789933
6096	3.785045	6131	3.787531	6166	3.790003
6097	3.785116	6132	3.787602	6167	3.790073
6098	3.785187	6133	3.787673	6168	3.790144
6099	3.785258	6134	3.787743	6169	3.790215
6100	3.785329	6135	3.787814	6170	3.790285
6101	3.785401	6136	3.787885	6171	3.790355
6102	3.785472	6137	3.787956	6172	3.790425
6103	3.785543	6138	3.788026	6173	3.790496
6104	3.785614	6139	3.788097	6174	3.790566
6105	3.785685	6140	3 788168	6175	3.790637
6106	3.785756	6141	3.788239	6176	3.790707
6107	3.785827	6142	3.788309	6177	3.790777
6108	3.785898	6143	3.788380	6178	3.790847
6109	3.785970	6144	3.788451	6179	3.790918
6110	3.786049	6145	3.788521	6180	3.790988
6111	3.786112	6146	3.788592	6181	3.791058
6112	3.786183	6147	3.788663	6182	3.791129
6113	3.786254	6148	3.788733	6183	3.791199
6114	3.786325	6149	3.788804	6184	3.791269
6115	3.786396	6150	3.788875	6185	3.791339
6116	3.786467	6151	3.788945	6186	3.791409
6117	3.786138	6152	3.789016	6187	3.791480
6118	3.786609	6153	3.789086	6188	3.791550
6119	3.786680	6144	3.789157	6189	3.791560
6120	3.786751	6155	3.789228	6190	3.791690
6121	3.786822	6156	3.789298	6191	3.791760
6122	3.786893	6157	3.789369	6192	3.791890
6123	3.786964	6158	3.789439	6193	3.791911
6124	3.787035	6159	3.789510	6194	3.791971
6125	3.787106	6160	3.789580	6195	3.792041

Num	Logarith.	Num	Logarith.	Num	Logarith.
6196	3.792111	6231	3.794557	6266	3.796990
6197	3.792181	6232	3.794627	6267	3.797059
6198	3.792251	6233	3.794697	6268	3.797129
6199	3.792321	6234	3.794766	6269	3.797198
6200	3.792391	6235	3.794836	6270	3.797267
6201	3.792461	6236	3.794906	6271	3.797336
6202	3.792531	6237	3.794975	6272	3.797406
6203	3.792601	6238	3.795045	6273	3.797475
6204	3.792671	6239	3.795115	6274	3.797544
6205	3.792741	6240	3.795184	6275	3.797613
6206	3.792811	6241	3.795254	6276	3.797682
6207	3.792881	6242	3.795323	6277	3.797752
6208	3.792951	6243	3.795393	6278	3.797821
6209	3.793021	6244	3.795462	6279	3.797890
6210	3.793091	6245	3.795532	6280	3.797959
6211	3.793161	6246	3.795602	6281	3.798028
6212	3.793231	6247	3.795671	6282	3.798097
6213	3.793301	6248	3.795741	6283	3.798167
6214	3.793371	6249	3.795810	6284	3.798236
6215	3.793441	6250	3.795880	6285	3.798305
6216	3.793511	6251	3.795949	6286	3.798374
6217	3.793580	6252	3.796019	6287	3.798443
6218	3.793650	6253	3.796088	6288	3.798512
6219	3.793720	6254	3.796157	6289	3.798581
6220	3.793790	6255	3.796227	6190	3.798650
6221	3.793860	6256	3.796296	6291	3.798719
6222	3.793930	6257	3.796366	6292	3.798788
6223	3.793999	6258	3.796435	6293	3.798857
6224	3.794069	6258	3.796505	6294	3.798926
6225	3.794139	6260	3.796574	6295	3.798995
6226	3.794209	6261	3.796643	6296	3.709064
6227	3.794278	6262	3.796713	6267	3.799133
6228	3.794348	6263	3.796782	6298	3.799202
6229	3.794418	6264	3.796850	6299	3.799271
6230	3.794488	6265	3.796921	6300	3.799340

Num	Logarith.	Num	Logarith.	Num	Logarith.
6301	3.799409	6336	3.801815	6371	3.804207
6302	3.799478	6337	3.801883	6372	3.804275
6303	3.799547	6338	3.801952	6373	3.804343
6304	3.799616	6339	3.802020	6374	3.804412
6305	3.799685	6340	3.802089	6375	3.804480
6306	3.799754	6341	3.802157	6376	3.804548
6307	3.799822	6342	3.802226	6377	3.804616
6308	3.799891	6343	3.802294	6378	3.804684
6309	3.799960	6344	3.802363	6379	3.804752
6310	3.800029	6345	3.802430	6380	3.804620
6311	3.800098	6346	3.802500	6381	3.804888
6312	3.800167	6347	3.802568	6382	3.804956
6313	3.800235	6448	3.802636	6383	3.805024
6314	3.800304	6349	3.802705	6384	3.005092
6315	3.800373	6350	3.802773	6385	3.805160
6316	3.800442	6351	3.802842	6386	3.805228
6317	3.800510	6352	3.802910	6387	3.805296
6318	3.800579	6353	3.802978	6388	3.805364
6319	3.800648	6354	3.803047	6389	3.805432
6320	3.800717	6355	3.803125	6390	3.805500
6321	3.800785	6356	3.803183	6391	3.805568
6322	3.800814	6357	3.803252	6392	3.805636
6323	3.800923	6358	3.803320	6393	3.805704
6324	3.800991	6359	3.803328	6394	3.805772
6325	3.801060	6360	3.803458	6395	3.805840
6326	3.801129	6361	3.803525	6396	3.805908
6327	3.801147	6562	3.803593	6397	3.805976
6328	3.801266	6363	3.803661	6398	3.806044
6329	3.801335	6364	3.803730	6399	3.806112
6330	3.801403	6365	3.803798	6400	3.806180
6331	3.801472	6366	3.803866	6401	3.806249
6332	3.801540	6367	3.803934	6402	3.806315
6333	3.801609	6368	3.804003	6403	3.806383
6334	3.801678	6369	3.804071	6404	3.806451
6335	3.801746	6370	3.804139	6405	3.806519

Num	Logarith.	Num	Logarith.	Num	Logarith.
6406	3. 806586	6441	3. 808953	6476	3. 811306
6407	3. 806654	6442	3. 809020	6477	3. 811373
6408	3. 806722	6443	3. 809088	6478	3. 811440
6409	3. 806790	6444	3. 809155	6479	3. 811508
6410	3. 806858	6445	3. 809222	6480	3. 811575
6411	3. 806925	6446	3. 809290	6481	3. 811642
6412	3. 806993	6447	3. 809357	6482	3. 811709
6413	3. 807061	6448	3. 809425	6483	3. 811776
6414	3. 807129	6449	3. 809492	6484	3. 811843
6415	3. 807196	6450	3. 809559	6485	3. 811910
6416	3. 827264	6451	3. 809627	6486	3. 811976
6417	3. 807332	6452	3. 809694	6487	3. 812043
6418	3. 807399	6453	3. 809761	6488	3. 812110
6419	3. 807467	6454	3. 809829	6489	3. 812177
6420	3. 807535	6455	3. 809896	6490	3. 812244
6421	3. 807602	6456	3. 809963	6491	3. 812311
6422	3. 807670	6457	3. 810030	6492	3. 812378
6423	3. 807737	6458	3. 810098	6493	3. 812445
6424	3. 807805	6459	3. 810165	6494	3. 812512
6425	3. 807873	6460	3. 810232	6495	3. 812579
6426	3. 807940	6461	3. 810299	6496	3. 812646
6327	3. 808008	6462	3. 810376	6497	3. 812712
6428	3. 808075	6463	3. 810434	6498	3. 812779
6429	3. 808143	6464	3. 810501	6499	3. 812846
6430	3. 808211	6465	3. 810568	6500	3. 812913
6431	3. 808278	6466	3. 810635	6501	3. 812380
6432	3. 808346	6467	3. 810702	6502	3. 813047
6433	3. 808413	6468	3. 810770	6503	3. 813113
6434	3. 808481	6469	3. 810837	6504	3. 813180
6435	3. 808548	6470	3. 810904	6505	3. 813247
6436	3. 808616	6471	3. 810971	6506	3. 813314
6437	3. 808683	6472	3. 811038	6507	3. 813380
6438	3. 808751	6473	3. 811105	6508	3. 813447
6439	3. 808818	6474	3. 811172	6509	3. 813514
6440	3. 808885	6475	3. 811239	6510	3. 814581

Num	Logarith.	Num	Logarith.	Num	Logarith.
6511	3.813647	6546	3.815976	6581	3.818291
6512	3.813714	6547	3.816042	6582	3.818357
6513	3.813781	6548	3.816108	6583	3.818423
6514	3.813847	6549	3.816175	6584	3.818489
6515	3.813914	6550	3.816241	6585	3.818555
6516	3.813981	6551	3.816307	6586	3.818621
6517	3.814047	6552	3.816383	6587	3.818687
6518	3.814114	6553	3.816440	6488	3.818753
6519	3.814181	6554	3.816506	6589	3.818819
6520	3.814247	5555	3.816572	6590	3.818885
6521	3.914314	6556	3.816638	6591	3.818951
6522	3.814380	6557	3.816705	6592	3.819087
6523	3.814447	6558	3.816771	6593	3.819083
6524	3.814514	6559	3.816837	6594	3.819148
6525	3.814580	6560	3.816903	6595	3.819214
6526	3.814647	6561	3.816970	6596	3.819280
6527	3.814713	6562	3.817036	6597	3.819346
6528	3.814780	6563	3.817108	6598	3.819412
6529	3.814846	6564	3.817162	6599	3.819478
6530	3.814913	6565	3.817234	6600	3.819543
6531	3.814379	6566	3.817300	6601	3.819609
6532	3.815046	6567	3.817367	6602	3.819675
6533	3.815112	6568	3.817433	6603	3.819741
6534	3.815179	6569	3.817499	6604	3.819807
6535	3.815245	6570	3.817565	6605	3.819872
6536	3.815312	6571	3.817631	6606	3.819938
6537	3.815378	6572	3.817697	6607	3.820004
6538	3.815444	6573	3.817763	6608	3.820170
6539	3.815511	6574	3.817829	6609	3.820135
6540	3.815577	6575	3.817895	6610	3.820201
6541	3.815644	6576	3.817401	6611	3.820267
6542	3.815710	6577	3.818027	6612	3.820332
6543	3.815776	6578	3.818093	6613	3.820398
6544	3.815843	6579	3.818159	6614	3.820464
6645	3.815909	6580	3.818225	6615	3.820529

Num	Logarith.	Num	Logarith.	Num	Logarith.
6616	3. 820595	6651	3. 822886	6686	3. 825100
6617	3. 820661	6652	3. 822952	6687	3. 825231
6618	3. 820726	6653	3. 823017	6688	3. 825296
6619	3. 820792	6654	3. 823082	6689	3. 825301
6620	3. 820858	6655	3. 823148	6690	3. 825426
6621	3. 820923	6656	3. 823213	6691	3. 825491
6622	3. 820989	6657	3. 823278	6692	3. 825555
6623	3. 821054	6658	3. 823343	6693	3. 825620
6624	3. 821120	6659	3. 823409	6694	3. 825685
6625	3. 821185	6660	3. 823474	6695	3. 825750
6626	3. 821251	6661	3. 823539	6696	3. 825815
6627	3. 821317	6662	3. 823604	6697	3. 825810
6628	3. 821382	6663	3. 823669	6698	3. 825945
6629	3. 821448	6664	3. 823735	6699	3. 826010
6530	3. 821513	6665	3. 823800	6700	3. 826074
6631	3. 821579	6666	3. 823865	6701	3. 826139
6632	3. 821644	6667	3. 823930	6702	3. 826204
6633	3. 821710	6668	3. 823995	6703	3. 826269
6634	3. 821775	6669	3. 824060	6704	3. 826334
6635	3. 821840	6670	3. 824125	6705	3. 826398
6636	3. 821906	6671	3. 824190	6706	3. 826463
6637	3. 821971	6672	3. 824256	6707	3. 826528
6638	3. 822037	6673	3. 824321	6708	3. 826593
6639	3. 822102	6674	3. 824386	6709	3. 826657
6640	3. 822168	6675	3. 824451	6710	3. 826722
6641	3. 822233	6676	3. 824516	6711	3. 826787
6642	3. 822298	6677	3. 824581	6712	3. 826851
6643	3. 822354	6678	3. 824646	6713	3. 826916
6644	3. 822429	6679	3. 824711	6714	3. 826981
6645	3. 822495	6680	3. 824779	6715	3. 827046
6646	3. 822560	6681	3. 824841	6716	3. 827110
6647	3. 822625	6682	3. 824906	6717	3. 827175
6648	3. 822691	6683	3. 824971	6718	3. 827240
6649	3. 822756	6684	3. 825036	6719	3. 827304
6650	3. 822821	6685	3. 825101	6720	3. 827369

Num	Logarith.	Num	Logarith.	Num	Logarith.
6721	3.827433	6756	3.829689	6791	3.831933
6722	3.827498	6757	3.829753	6792	3.831997
6723	3.827563	6758	3.829818	6793	3.832061
6724	3.827627	6759	3.829882	6794	3.832125
6725	3.827692	6760	3.829946	6795	3.832189
6726	3.827756	6761	3.830010	6796	3.832253
6727	3.827821	6762	3.830075	6797	3.832317
6728	3.827886	6763	3.830139	6798	3.832381
6729	3.827950	6764	3.830203	6799	3.832445
6730	3.828015	6765	3.830267	6800	3.832508
6731	3.828079	6766	3.830332	6801	3.832572
6732	3.828144	6767	3.830396	6802	3.832636
6733	3.828208	6768	3.830460	6803	3.832700
6734	3.828273	6769	3.830524	6804	3.832764
6735	3.828337	6770	3.830583	6805	3.832828
6736	3.828402	6771	3.830652	6806	3.832891
6737	3.828466	6772	3.830716	6807	3.832955
6738	3.828531	6773	3.830781	6808	3.833019
6739	3.828595	6774	3.830845	6809	3.833083
6740	3.828659	6775	3.830909	6810	3.833147
6741	3.828724	6776	3.830973	6811	3.833210
6742	3.828788	6777	3.831037	6812	3.833274
6743	3.828853	6778	3.831101	6813	3.833338
6744	3.828917	6779	3.831165	6814	3.833402
6745	3.828982	6780	3.831229	6815	3.833465
6746	3.829046	6781	3.831293	6816	3.833529
6747	3.829110	6782	3.831357	6817	3.833593
6748	3.829179	6783	3.831421	6818	3.833657
6749	3.829235	6784	3.831485	6819	3.833720
6750	3.829303	6785	3.831549	6820	3.833784
6751	3.829368	6786	3.831613	6821	3.833848
6752	3.829432	6787	3.831677	6822	3.833911
6753	3.829496	6788	3.831741	6823	3.833975
6754	3.829561	6789	3.831805	6824	3.834039
6755	3.829625	6790	3.831869	6825	3.834102

Num	Logariht.	Num	Logarith.	Num	Logarith.
6826	3. 834166	6861	3. 836367	6896	3. 838597
6827	3. 834229	6862	3. 836450	6897	3. 838660
6828	3. 834293	6863	3. 836514	6898	3. 838723
6829	3. 834357	6864	3. 836577	6899	3. 838786
6830	3. 834420	6865	3. 836640	6900	3. 839849
6831	3. 834484	6866	3. 836703	6901	3. 838912
6832	3. 834547	6867	3. 836767	6902	3. 838975
6833	3. 834611	6868	3. 836830	6903	3. 839037
6834	3. 834675	6869	3. 836893	6904	3. 839100
6835	3. 834738	6870	3. 836957	6905	3. 839163
6836	3. 834802	6871	3. 837019	6906	3. 839226
6837	3. 834865	6872	3. 837083	6937	3. 839289
6838	3. 834929	6873	3. 837146	6908	3. 839352
6839	3. 834992	6874	3. 837209	6909	3. 839415
6840	3. 835056	6875	3. 837272	6910	3. 839478
6841	3. 835119	6876	3. 837335	6911	3. 839540
6842	3. 835183	6877	3. 837399	6912	3. 839603
6843	3. 835246	6878	3. 837462	6913	3. 839666
6844	3. 835310	6879	3. 837525	6914	3. 839729
6845	3. 835373	6880	3. 837588	6915	3. 839792
6846	3. 835436	6881	3. 837651	6916	3. 839855
6847	3. 835500	6882	3. 837714	6917	3. 839917
6848	3. 835563	6883	3. 837777	6918	3. 839980
6849	3. 835627	6884	3. 837840	6919	3. 840043
6850	3. 835690	6885	3. 837903	6920	3. 840106
6851	3. 835754	6886	3. 837967	6921	3. 840168
6852	3. 835817	6887	3. 838030	6922	3. 840231
6853	3. 835880	5888	3. 838093	6923	3. 840294
6854	3. 835944	6889	3. 838156	6924	3. 840357
6855	3. 836007	6890	3. 838219	6925	3. 840419
6856	3. 836070	6891	3. 838282	6926	3. 840482
6857	3. 836134	6892	3. 838345	6927	3. 840545
6858	3. 836197	6893	3. 838408	6928	3. 840607
6859	3. 836260	6894	3. 838471	6929	3. 840670
6860	3. 836324	6895	3. 838534	6930	3. 840733

Num	Logarith.	Num	Logarith.	Num	Logarith.
6931	3. 840795	6966	3. 842983	7001	3. 845160
6932	3. 840858	6967	3. 843045	7002	3. 845222
6933	3. 840921	6968	3. 843108	7003	3. 845184
6934	3. 840983	6969	3. 843170	7004	3. 845346
9935	3. 841046	6970	3. 843232	7005	3. 845408
6936	3. 841109	6971	3. 843295	7006	3. 845470
6937	3. 841171	6972	3. 843357	7007	3. 845532
6938	3. 841234	6973	3. 843419	7008	3. 845594
6939	3. 841296	6974	3. 843481	7009	3. 845656
6940	3. 841359	6975	3. 843544	7010	3. 845718
6941	3. 841422	6976	3. 843606	7011	3. 845780
6942	3. 841484	6977	3. 843668	7012	3. 845841
6943	3. 841547	6978	3. 843731	7013	3. 845903
6944	3. 841609	6979	3. 843793	7014	3. 845965
6945	3. 842672	6980	3. 843855	7015	3. 846027
6946	3. 841734	6981	3. 843917	7016	3. 846089
6947	3. 841797	6982	3. 843979	7017	3. 846151
6948	3. 841859	6983	3. 844042	7018	3. 846213
6949	3. 841922	6984	3. 844104	7019	3. 846275
6950	3. 841984	6985	3. 844166	7020	3. 846337
6951	3. 842047	6986	3. 844228	7021	3. 846399
6952	3. 842109	6987	3. 844290	7022	3. 846460
6953	3. 842172	6988	3. 844352	7023	3. 846422
6954	3. 842234	6989	3. 844415	7024	3. 846584
6955	3. 842297	6990	3. 844477	7025	3. 846646
6956	3. 842359	6991	3. 844539	7026	3. 846708
6957	3. 842422	6992	3. 844601	7027	3. 846770
6958	3. 842484	6993	3. 844663	7028	3. 846831
6959	3. 842546	6994	3. 844725	7029	3. 846893
6960	3. 842609	6995	3. 844787	7030	3. 846955
6961	3. 842671	6996	3. 844849	7031	3. 847017
6962	3. 842734	6997	3. 844911	7032	3. 847078
6963	3. 842796	6998	3. 844973	7033	3. 847140
6964	3. 842858	6999	3. 845036	7034	3. 847202
6965	3. 842921	7000	3. 845098	7035	3. 847264

Num	Logarith.	Num	Logarith.	Num	Logarith.
7036	3. 847325	7071	3. 849480	7106	3. 851625
7037	3. 847387	7072	3. 849542	7107	3. 851686
7038	3. 847449	7073	3. 849603	7108	3. 851747
7039	3. 847511	7074	3. 849665	7109	3. 851808
7040	3. 847572	7075	3. 849726	7110	3. 851869
7041	3. 847634	7076	3. 849787	7111	3. 851930
7042	3. 847696	7077	3. 849849	7112	3. 851991
7043	3. 847757	7078	3. 849910	7113	3. 852052
7044	3. 847819	7079	3. 849971	7114	3. 852113
7045	3. 847881	7080	3. 850033	7115	3. 852174
7046	3. 847942	7081	3. 850094	7116	3. 852235
7047	3. 848004	7082	3. 850155	7117	3. 852297
7048	3. 848065	7083	3. 850217	7118	3. 852358
7049	3. 848127	7084	3. 850278	7119	3. 852419
7050	3. 848189	8085	3. 850339	7120	3. 852480
7051	3. 848250	7086	3. 850401	7121	3. 852541
7052	3. 848312	7087	3. 850462	7122	3. 852602
7053	3. 848373	7088	3. 850523	7123	3. 852662
7054	3. 848435	7089	3. 850585	7124	3. 852723
7055	3. 848497	7090	3. 850646	7125	3. 852784
7056	3. 848558	7091	3. 850707	7126	3. 852845
7057	3. 848620	7092	3. 850768	7127	3. 852906
7058	3. 848681	7093	3. 850830	7128	3. 852967
7059	3. 848747	7094	3. 850891	7129	3. 853028
7060	3. 848808	7095	3. 850952	7130	3. 853089
7061	3. 848866	7096	3. 851013	7131	3. 853150
7062	3. 848927	7097	3. 751074	7132	3. 853211
7063	3. 848989	7098	3. 851136	7133	3. 853272
7064	3. 849050	7099	3. 851197	7134	3. 853333
7065	3. 849112	7100	3. 851258	7135	3. 853304
7066	3. 849173	7101	3. 851319	7136	3. 853454
7067	3. 849235	7102	3. 851381	7137	3. 853815
7068	3. 849294	7103	3. 851441	7138	3. 853576
7069	3. 849358	7104	3. 851503	7139	3. 853637
7070	3. 849419	7105	3. 851564	7140	3. 853698

Num	Logarith.	Num	Logarith.	Num	Logarith.
7141	3.853759	7176	3.855882	7211	3.857995
7142	3.853819	7177	3.855942	7212	3.858055
7143	3.853880	7178	3.856003	7213	3.858115
7144	3.853941	7179	3.856064	7214	3.858176
7145	3.854002	7180	3.856124	7215	3.858236
7146	3.854063	7181	3.856182	7216	3.858296
7147	3.854123	7182	3.856245	7217	3.858356
7148	3.854184	7183	3.856305	7218	3.858416
7149	3.854245	7184	3.856366	7219	3.858477
7150	3.854306	7185	3.856426	7220	3.858537
7151	3.854366	7186	3.856487	7221	3.856597
7152	3.854426	7187	3.856547	7220	3.858657
7153	3.854488	7188	3.856608	7223	3.858717
7154	3.854548	7189	3.856668	7224	3.858777
7155	3.854609	7190	3.856728	7225	3.858837
7156	3.854670	7191	3.856789	7220	3.858898
7157	3.854731	7192	3.856849	7227	3.858958
7158	3.854791	7193	3.856910	7228	3.859018
7159	3.854852	7194	3.856970	7229	3.859078
7160	3.854913	7195	3.857030	7230	3.859138
7161	3.854973	7196	3.857091	7231	3.859198
7162	3.855034	7197	3.857151	7232	3.859258
7163	3.855094	7198	3.857211	7233	3.859318
7164	3.855155	7199	3.857272	7234	3.859378
7165	3.855216	7200	3.857332	7235	3.859438
7166	3.855276	7201	3.857392	7236	3.859498
7167	3.855337	7202	3.857453	7237	3.859558
7168	3.855398	7203	3.857513	7238	3.859618
7169	3.855458	7204	3.857573	7239	3.859678
7170	3.855519	7205	3.857634	7240	3.859738
7171	3.855579	7206	3.857694	7241	3.859798
7172	3.855640	7207	3.857754	7242	3.859858
7173	3.855700	7208	3.857814	7243	3.859918
7174	3.855761	7209	3.857875	7244	3.859978
7175	3.855821	7210	3.857935	7245	3.860038

Num	Logarith.	Num	Logarith.	Num	Logarith.
7246	3. 860098	7281	3. 862191	7316	3. 864273
7247	3. 860158	7282	3. 862250	7317	3. 864333
7248	3. 860218	7283	3. 862310	7318	3. 864392
7249	3. 860278	7284	3. 862369	7319	3. 864451
7250	3. 860338	7285	3. 862429	7320	3. 864511
7251	3. 860397	7286	3. 862489	7321	3. 864570
7252	3. 860457	7287	3. 862548	7322	3. 864629
7253	3. 860517	7288	3. 862608	7323	3. 864649
7254	3. 860577	7289	3. 862667	7324	3. 964788
7255	3. 860637	7290	3. 862727	7325	3. 864807
7256	3. 860697	7291	3. 862787	7326	3. 864866
7257	3. 860757	7292	3. 862846	7327	3. 864926
7258	3. 860817	7293	3. 862906	7328	3. 854935
7259	3. 860876	7294	3. 862965	7329	3. 865044
7260	3. 860936	7295	3. 863025	7330	3. 865104
7261	3. 860996	7296	3. 863084	7331	3. 805163
7262	3. 861056	7297	3. 863144	7332	3. 865222
7263	3. 861116	7298	3. 863203	7333	3. 865281
7264	3. 861175	7299	3. 863263	7334	3. 865340
7265	3. 861235	7300	3. 863322	7335	3. 865400
7266	3. 861295	7301	3. 863362	7336	3. 865459
7267	3. 861355	7302	3. 863441	7337	3. 865518
7268	3. 861414	7303	3. 863501	7238	3. 865577
7269	3. 851474	7304	3. 863560	7339	3. 864636
7270	3. 861534	7305	3. 853620	7340	3. 865696
7271	3. 861594	7306	3. 863679	7341	3. 865755
7272	3. 861653	7307	3. 863739	6342	3. 865814
7273	3. 861713	7308	3. 863798	7343	3. 865873
7274	3. 871773	7309	3. 863858	7344	3. 865932
7275	3. 861833	7310	3. 863917	7345	3. 865991
7276	3. 861892	7311	3. 863976	7346	3. 866050
7277	3. 861952	7312	3. 864036	7347	3. 866110
7278	3. 862012	7313	3. 864095	7348	3. 866169
7279	3. 862071	7314	3. 864155	7349	3. 866228
7280	3. 862131	7315	3. 864214	7350	3. 866287

Num	Logarith.	Num	Logarith.	Num	Logarith.
7351	3. 866346	7386	3. 868409	7421	3. 870462
7352	3. 866405	7387	3. 868468	7422	3. 870520
7353	3. 866464	7388	3. 868526	7423	3. 870579
7354	3. 866523	7389	3. 868585	7424	3. 870638
7355	3. 866582	7390	3. 868644	7425	3. 870696
7356	3. 866641	7391	3. 868703	7426	3. 870754
7357	3. 866700	7392	3. 868762	7427	3. 870813
7358	3. 866759	7393	3. 868820	7428	3. 870871
7359	3. 866818	7394	3. 868879	7429	3. 870930
7360	3. 866876	7395	3. 868938	7430	3. 870988
7361	3. 866936	7396	3. 868996	7431	3. 871047
7362	3. 866995	7397	3. 869055	7432	3. 871105
7363	3. 867054	7398	3. 869114	7433	3. 871164
7364	3. 867111	7399	3. 869173	7434	3. 871222
7365	3. 867172	7400	3. 869231	7435	3. 871281
7366	3. 867231	7401	3. 869290	7436	3. 871339
7367	3. 867290	7402	3. 869348	7437	3. 871397
7368	3. 867349	7403	3. 869407	7438	3. 871456
7369	3. 867408	7404	3. 869469	7439	3. 871514
7370	3. 867767	7405	3. 869525	7440	3. 871572
7371	3. 867520	7406	3. 869583	7441	3. 871631
7372	3. 867585	7407	3. 869642	7442	3. 871689
7373	3. 867644	7408	3. 869701	7443	3. 871748
7374	3. 867703	7409	3. 869759	7444	3. 871806
7375	3. 867762	7410	3. 869818	7445	3. 871864
7376	3. 867820	7411	3. 869876	7446	3. 871923
7377	3. 867879	7412	3. 869935	7447	3. 871981
7378	3. 867938	7413	3. 869994	7448	3. 872039
7379	3. 867997	7414	3. 870052	7449	3. 872098
7380	3. 868046	7415	3. 870111	7450	3. 872156
7381	3. 868115	7416	3. 870169	7451	3. 872214
7382	3. 868174	7417	3. 870228	7452	3. 872272
7383	3. 868232	7418	3. 870286	7453	3. 872331
7384	3. 868291	7419	3. 870345	7454	3. 872389
7385	3. 868350	7420	3. 870403	7455	3. 872147

Num	Logarith.	Num	Logarith.	Num	Logarith.
7456	3.872505	7491	3.874539	7526	3.876564
7457	3.872564	7492	3.874597	7527	3.876621
7458	3.872622	7493	3.874655	7528	3.876679
7459	3.872680	7494	3.874713	7529	3.876737
7460	3.872738	7495	3.874771	7530	3.876795
7461	3.872797	7496	3.874829	7531	3.876852
7462	3.872855	7497	3.874887	7532	3.876910
7463	3.872813	7498	3.874945	7533	3.876968
7464	3.872971	7499	3.875003	7534	3.877025
7465	3.872029	7500	3.875061	7535	3.877083
7466	3.873088	7501	3.875119	7536	3.877140
7467	3.873146	7502	3.875177	7537	3.877198
7468	3.873204	7503	3.875234	7538	3.877256
7469	3.873262	7504	3.875292	7539	3.877313
7470	3.873320	7505	3.875350	7540	3.877371
7471	3.873378	7506	3.875408	7541	3.877428
7472	3.873436	7507	3.875466	7542	3.877486
7473	3.873495	7508	3.875524	7543	3.877544
7474	3.873553	7509	3.875582	7544	3.877601
7475	3.873611	7510	3.875639	7545	3.877659
7476	3.873669	7511	3.875697	7546	3.877716
7477	3.873727	7512	3.875755	7547	3.877774
7478	3.873785	7513	3.875813	2548	3.877831
7479	3.873843	7514	3.875871	7549	3.877889
7480	3.873901	7515	3.875929	7550	3.877946
7481	3.873959	7516	3.875986	7551	3.878004
7482	3.874017	7517	3.876044	7552	3.878062
7483	3.874075	7518	3.876102	7553	3.878119
7484	3.874133	7519	3.876160	7554	3.878177
7485	3.874191	7520	3.876217	7555	3.878234
7486	3.874249	7521	3.876275	7556	3.878291
7487	3.874307	7522	3.876333	7557	3.878349
7488	3.874365	7523	3.876391	7558	3.878406
7489	3.874423	7524	3.876448	7559	3.878464
7490	3.874471	7525	3.876506	7560	3.878520

Num	Logarith.	Num	Logarith.	Num	Logarith.
7561	3. 878570	7596	3. 880565	7631	3. 882581
7562	3. 878536	7597	3. 880642	7632	3. 882638
7563	3. 878694	7598	3. 880699	7633	3. 882695
7564	3. 878751	7599	3. 880756	7634	3. 882752
7565	3. 878808	7600	3. 880813	7635	3. 882809
7566	3. 878866	7601	3. 880870	7636	3. 882865
7567	3. 878923	7602	3. 880927	7637	3. 882922
7568	3. 878981	7603	3. 880985	7638	3. 882979
7569	3. 879038	7604	3. 881042	7639	3. 883036
7570	3. 879095	7605	3. 881099	7640	3. 883093
7571	3. 879153	7606	3. 881156	7641	3. 883150
7572	3. 879210	7607	3. 881213	7642	3. 883207
7573	3. 879268	7608	3. 881270	7643	3. 883263
7574	3. 879325	7609	3. 881327	7644	3. 883320
7575	3. 879382	7010	3. 881384	7645	3. 883377
7576	3. 879440	7611	3. 881441	7646	3. 883434
7577	3. 879497	7612	3. 881498	7647	3. 883491
7578	3. 879554	7613	3. 881555	7648	3. 883547
7579	3. 879611	7614	3. 881612	7649	3. 883604
7570	3. 879669	7615	3. 881669	7650	3. 883661
7581	3. 879726	7616	3. 881726	7051	3. 883718
7582	3. 879783	7617	3. 881784	7652	3. 883775
7583	3. 879841	7618	3. 881841	7653	3. 883831
7584	3. 879898	7619	3. 881898	7654	3. 883888
7585	3. 879955	7620	3. 881955	7655	3. 883945
7586	3. 880012	7621	3. 882012	7656	3. 884001
7587	3. 880070	7622	3. 882068	7657	3. 884058
7588	3. 880127	7623	3. 882125	7658	3. 884115
7589	3. 880184	7624	3. 832282	7659	3. 884172
7590	3. 880241	7625	3. 882239	7660	3. 884228
7591	3. 880299	7626	3. 882096	7661	3. 884285
7592	3. 880356	7627	3. 882353	7662	3. 884342
7593	3. 880413	7628	3. 882410	7663	3. 884398
7594	3. 880470	7629	3. 882467	7664	3. 884455
7595	3. 880527	7630	3. 882524	7665	3. 884512

Num	Logarith.	Num	Logarith.	Num	Logarith.
7660	3.884568	7701	3.886547	7736	3.888516
7667	3.384625	7702	3.886603	7737	3.888572
7668	3.884682	7703	3.886659	7738	3.888628
7669	3.884738	7704	3.886716	7739	3.888684
7670	3.884795	7705	3.886772	7740	3.888741
7671	3.884852	7706	3.886829	7741	3.888797
7672	3.884908	7707	3.886885	7742	3.888853
7673	3.884965	7708	3.886941	7743	3.888909
7674	3.885021	7709	3.886998	7744	3.888965
7675	3.885078	7710	3.887050	7745	3.889026
7676	3.885135	7711	3.887110	7746	3.889077
7677	3.885191	7712	3.887167	7747	3.889133
7678	3.885248	7713	3.887223	7748	3.889189
7679	3.885304	7714	3.887279	7749	3.889245
7680	4.885361	7715	3.887335	7750	3.889301
7681	3.885417	7716	3.887392	7751	3.889357
7682	3.885474	7717	3.887448	7752	3.889413
7683	3.885530	7718	3.887504	7733	3.889469
7684	3.885587	7719	3.887561	7754	3.889525
7685	3.885643	7720	3.887617	7755	3.889581
7686	3.885700	7721	3.887673	7756	3.889637
7687	3.885756	7722	3.887729	7757	3.889693
7688	3.885813	7723	3.887786	7758	3.889749
7689	3.785869	7724	3.887842	7759	3.889805
7690	3.885926	7725	3.887898	7760	3.889861
7691	3.885982	7726	3.887954	7761	3.889917
7692	3.886039	7727	3.888010	7762	3.889973
7693	3.886095	7728	3.888067	7763	3.890029
7694	3.886152	7729	3.888123	7764	3.890085
7695	3.886200	7730	3.888179	7765	3.890141
7696	3.886265	7731	3.888235	7766	3.890197
7697	3.886321	7732	3.888091	7767	3.890253
7698	3.886377	7733	3.888348	7768	3.890309
7699	3.886434	7734	3.888404	7769	3.890366
7700	3.886490	7735	3.888460	7770	3.890421

Num	Logarith.	Num	Logarith.	Num	Logarith.
7771	3.890476	7806	3.892428	7841	3.894371
7772	3.890532	7807	3.892484	7842	3.894426
7773	3.890588	7808	3.892539	7843	3.894482
7774	3.890644	7809	3.892595	7844	3.894537
7775	3.890700	7810	3.892651	7845	3.894593
7776	3.890756	7811	3.892706	7846	3.894648
7777	3.890812	7812	3.892762	7847	3.894703
7778	3.890867	7813	3.892817	7848	3.894759
7779	3.890923	7814	3.892873	7849	3.894814
7780	3.890979	7815	3.892929	7850	3.894869
7781	3.891035	7816	3.892984	7851	3.894925
7782	3.891091	7817	3.893040	7852	3.894980
7783	3.891147	7818	3.893095	7853	3.895035
7784	3.891202	7819	3.893151	7854	3.895090
7785	3.891258	7820	3.893206	7855	3.895146
7786	3.891314	7821	3.893262	7856	3.895201
7787	3.891370	7822	3.893317	7857	3.895256
7788	3.891425	7823	3.893373	7858	3.895312
7789	3.891481	7824	3.893428	7859	3.895367
7790	3.891537	7825	3.893484	7860	3.895422
7791	3.891593	7826	3.893539	7861	3.895477
7792	3.891648	7827	3.893595	7862	3.895533
7793	3.891704	7828	3.893650	7863	3.895588
7794	3.891760	7829	3.893706	7864	3.895643
7795	3.891816	7830	3.893761	7865	3.895698
7796	3.891871	7831	3.893817	7866	3.895753
7797	3.891927	7832	3.893872	7867	3.895809
7798	3.891983	7833	3.893928	7868	3.895864
7799	3.892038	7834	3.893983	7869	3.895919
7800	3.892094	7835	3.894030	7870	3.895974
7801	3.892150	7836	3.894094	7871	3.896024
7802	3.892205	7837	3.894149	7872	3.896085
7803	3.892261	7838	3.894205	7873	3.896140
7804	3.892317	7839	3.894260	7874	3.896195
7805	3.892372	7840	3.894316	7875	3.896250

Num	Logarith.	Num	Logarith.	Num	Logarith.
7876	3. 896305	7911	3. 898231	7946	3. 900148
7877	3. 896360	7912	3. 898286	7947	3. 900203
7878	3. 896416	7913	3. 898341	7948	3. 900257
7879	3. 896471	7914	3. 898396	7949	3. 900312
7880	3. 896526	7915	3. 898450	7950	3. 900367
7881	3. 896581	7916	3. 898505	7951	3. 900421
7882	3. 896636	7917	3. 898560	7952	3. 900476
7883	3. 896691	7918	3. 898615	7953	3. 900521
7884	3. 896746	7919	3. 898670	7954	3. 900585
7885	3. 896801	7920	3. 898725	7955	3. 900640
7886	3. 896850	7921	3. 898780	7956	3. 900694
7887	3. 896911	7922	3. 898834	7957	3. 900749
7888	3. 896966	7923	3. 898889	7958	3. 900803
7889	3. 897022	7924	3. 898944	7959	3. 900858
7890	3. 897077	7925	3. 898999	7960	3. 900913
7891	3. 897132	7926	3. 899044	7961	3. 900967
7892	3. 897187	7927	3. 899108	7962	3. 900022
7893	3. 897242	7928	3. 899163	7963	3. 901076
7894	3. 897297	7929	3. 899218	7964	3. 901131
7895	3. 897352	7930	3. 899273	7965	3. 901185
7896	3. 897407	7931	3. 899327	7966	3. 901240
7897	3. 897462	7932	3. 899382	7967	3. 901294
7898	3. 897517	7933	3. 899437	7968	3. 901349
7899	3. 897572	7934	3. 899492	7969	3. 901403
7900	3. 897627	7935	3. 899546	7970	3. 901458
7901	3. 897682	7936	3. 899602	7971	3. 901512
7902	3. 897737	7937	3. 899656	7972	3. 901567
7903	3. 897792	7938	3. 899711	7973	3. 901621
7904	3. 897846	7939	3. 899765	7974	3. 901676
7905	3. 897901	7940	3. 899810	7975	3. 901730
7906	3. 897956	7941	3. 899895	7976	3. 901785
7907	3. 898011	7942	3. 899929	7977	3. 901839
7908	3. 898066	7943	3. 899984	7978	3. 901894
7909	3. 898121	7944	3. 900039	7979	3. 901948
7910	3. 898176	7945	3. 900093	7980	3. 902002

Num	Logarith.	Num	Logarith.	Num	Logarith.
7981	3. 902057	8016	3. 903957	8051	3. 905849
7982	3. 902111	8017	3. 904011	8052	3. 905903
7983	3. 902166	8018	3. 904066	8053	3. 905957
7984	3. 902220	8019	3. 904120	8054	3. 906011
7985	3. 902274	8020	3. 904174	8055	3. 906065
7986	3. 902329	8021	3. 904228	8056	3. 906119
7987	3. 902383	8022	3. 904282	8057	3. 906173
7988	3. 902438	8023	3. 904336	8058	3. 906227
7989	3. 902492	8024	3. 904390	8059	3. 906281
7990	3. 902546	8025	3. 904445	8060	3. 906335
7991	3. 902601	8026	3. 904499	8061	3. 906388
7992	3. 902655	8027	3. 904553	8062	3. 906442
7993	3. 902729	8028	3. 904607	8063	3. 906496
7994	3. 902764	8029	3. 904662	8064	3. 906550
7995	3. 902818	8030	3. 904715	8065	3. 906604
7996	3. 908873	8031	3. 904769	8066	3. 806658
7997	3. 909227	8032	3. 904823	8067	3. 906712
7998	3. 909281	8033	3. 904877	8068	3. 906765
7999	3. 900335	8034	3. 904931	8069	3. 906819
8000	3. 900390	8035	3. 904985	8070	3. 906873
8001	3. 903144	8036	3. 905039	8071	3. 906927
8002	3. 903198	8037	3. 905094	8072	3. 906981
8003	3. 903252	8038	3. 905148	8073	3. 907035
8004	3. 903307	8039	3. 905202	8074	3. 907088
8005	3. 903361	8040	3. 905256	8075	3. 907142
8006	3. 903415	8041	3. 905310	8076	3. 907196
8007	3. 903469	8042	3. 905364	8077	3. 907250
8008	3. 903524	8043	3. 905418	8078	3. 907303
8009	3. 903578	8044	3. 905472	8079	3. 907357
8010	3. 903633	8045	3. 905526	8080	3. 907411
8011	3. 903686	8046	3. 905580	8081	3. 907465
8012	3. 903740	8047	3. 905634	8082	3. 907518
8013	3. 903795	8048	3. 905688	8083	3. 907572
8014	3. 903849	8049	3. 905742	8084	3. 907626
8015	3. 903903	8050	3. 905796	8085	3. 907680

Num	Logarith.	Num	Logarith.	Num	Logarith.
8086	3. 907733	8121	3. 909609	8156	3. 911477
8087	3. 907787	8122	3. 909663	8157	3. 911530
8088	3. 907841	8123	3. 909716	8158	3. 911583
8089	3. 907894	8124	3. 909769	8159	3. 911636
8090	3. 907948	8125	3. 909823	8160	3. 911690
8091	3. 908002	8126	3. 909876	8161	3. 911743
8092	3. 908056	8127	3. 909930	8162	3. 911796
8093	3. 908109	8128	3. 909983	8163	3. 911849
8094	3. 908163	8129	3. 910037	8164	3. 911903
8095	3. 908216	8130	3. 910090	8165	3. 911956
8096	3. 908270	8131	3. 910144	8166	3. 912009
8097	3. 908324	8132	3. 910197	8167	3. 912062
8098	3. 908377	8133	3. 910254	8168	3. 912115
8099	3. 908431	8134	3. 910300	8169	3. 912168
8100	3. 908485	8135	3. 910357	8170	3. 912222
8101	3. 908538	8136	3. 910410	8171	3. 912275
8102	3. 908592	8137	3. 910464	8172	3. 912323
8103	3. 908645	8138	3. 910517	8173	3. 912381
8104	3. 908699	8139	3. 910571	8174	3. 912434
8105	3. 908753	8140	3. 910624	8175	3. 912487
8106	3. 908806	8141	3. 910677	8176	3. 912540
8107	3. 908860	8142	3. 910731	8177	3. 912594
8108	3. 908913	8143	3. 910784	8178	3. 912647
8109	3. 908967	8144	3. 910837	8179	3. 912700
8110	3. 909020	8145	8. 910891	8180	3. 912753
8111	3. 909074	8146	3. 910944	8181	3. 912806
8112	3. 909127	8147	3. 910997	8182	3. 912859
8113	3. 909181	8148	3. 911051	8183	3. 912912
8114	3. 909235	8149	3. 911104	8184	3. 912965
8115	3. 909288	8150	3. 911157	8185	3. 913018
8116	3. 909342	8151	3. 911210	8186	3. 913071
8117	3. 909395	8152	3. 911264	8187	3. 913124
8118	3. 909249	8153	3. 911317	8188	3. 913177
8119	3. 909502	8154	3. 911370	8189	3. 913230
8120	3. 909556	8155	3. 911424	8190	3. 913283

Num	Logarith.	Num	Logarith.	Num	Logarith.
8191	3. 913336	8226	3. 915188	8261	3. 917032
8192	3. 913389	8227	3. 915241	8262	3. 917085
8193	3. 913443	8228	3. 915294	8263	3. 917137
8194	3. 913496	8229	3. 915347	8264	3. 917190
8195	3. 913549	8230	3. 915399	8265	3. 917242
8196	3. 913601	8231	3. 915452	8266	3. 917295
8197	3. 913654	3232	3. 915505	8267	3. 917347
8198	3. 913707	8233	3. 915558	8268	3. 917400
8199	3. 813760	8234	3. 915610	8269	3. 917453
8200	3. 913813	8235	3. 915663	8270	3. 917505
8201	3. 913866	8236	3. 915716	8271	3. 917550
8202	3. 913919	8237	3. 915769	8272	3. 917610
8203	3. 913972	8238	3. 915821	8273	3. 917663
8204	3. 914025	8239	3. 915874	8274	3. 917715
8205	3. 914078	8240	3. 915927	8275	3. 917768
8206	3. 914131	8241	3. 915979	8276	3. 917820
8207	3. 914184	8242	3. 916032	8277	3. 917873
8208	3. 914237	8243	3. 916085	8278	3. 917925
8209	3. 914290	8244	3. 916138	8279	3. 917977
8210	3. 914343	8245	3. 916190	8280	3. 918030
8211	3. 914399	8246	3. 916243	8281	3. 918082
8212	3. 914448	8247	3. 916296	8282	3. 918135
8213	3. 914501	8248	3. 916448	8283	3. 918187
8214	3. 914554	8249	3. 916301	8284	3. 918240
8215	3. 914607	8250	3. 816453	8285	3. 918262
8216	3. 914660	8251	3. 916606	8280	3. 918344
8217	3. 914713	8252	3. 916559	8287	3. 918397
8218	3. 914766	8253	3. 916611	8288	3. 918449
8219	3. 914819	8254	3. 916764	8289	3. 918502
8220	3. 914871	8255	3. 916717	8290	3. 918554
8221	3. 914924	8256	3. 916769	8291	3. 918606
8222	3. 914977	8257	3. 916822	8292	3. 918659
8223	3. 915030	8258	3. 916374	8293	3. 918711
8224	3. 915083	8259	3. 916927	8294	3. 918764
8225	3. 915135	8260	3. 916980	8295	3. 918816

Num	Logarith.	Num	Logarith.	Num	Logarith.
8296	3. 918868	8331	3. 920697	8366	3. 922517
8297	3. 918921	8332	3. 920749	8367	3. 922569
8298	3. 918973	8333	3. 920801	8368	3. 922621
8299	3. 919025	8334	3. 920853	8369	3. 922673
8300	3. 919078	8335	3. 920905	8370	3. 922725
8301	3. 919130	8336	3. 920957	8371	3. 922777
8302	3. 919182	8337	3. 921009	8372	3. 922829
8303	3. 919235	8338	3. 921061	8373	3. 922881
8304	3. 919287	8339	3. 921114	8374	3. 922933
8305	3. 919339	8340	3. 921169	8375	3. 922984
8306	3. 919391	8341	3. 921478	8376	3. 923036
8307	3. 919444	8342	3. 921530	8377	3. 923088
8308	3. 919496	8343	3. 921582	8378	3. 923140
8309	3. 919548	8344	3. 921634	8379	3. 923192
8310	3. 919601	8345	3. 921686	8380	3. 923244
8311	3. 919653	8346	3. 921738	8381	3. 923295
8312	3. 919705	8347	3. 921790	8382	3. 923347
8313	3. 919757	8348	3. 921842	8383	3. 923399
8314	3. 919810	8349	3. 921894	8384	3. 923451
8315	3. 919862	8350	3. 921946	8385	3. 923503
8316	3. 919914	8351	3. 921738	8386	3. 923554
8317	3. 919966	8352	3. 921790	8387	3. 923606
8318	3. 920018	8353	3. 921842	8388	3. 923658
8319	3. 920071	8354	3. 921894	8389	3. 923710
8320	3. 920123	8355	3. 921946	8390	3. 923762
8321	3. 920175	8356	3. 921998	8391	3. 923813
8322	3. 920227	8357	3. 922050	8392	3. 923865
8323	3. 920279	8358	3. 922102	8393	3. 923917
8324	3. 920332	8359	3. 922154	8394	3. 923969
8325	3. 920384	8360	3. 922206	8395	3. 924020
8326	3. 920436	8361	3. 922258	8396	3. 924072
8327	3. 920488	8362	3. 922310	8397	3. 924124
8328	3. 920540	8363	3. 622362	8398	3. 924175
8329	3. 920592	8364	3. 922414	8399	3. 924227
8330	3. 920645	8365	3. 922465	8400	3. 924279

Num	Logarith.	Num	Logarith.	Num	Logarith.
8401	3.924331	8436	3.926136	8471	3.927934
8402	3.924382	8437	3.926188	8472	3.927985
8403	3.924434	8438	3.926239	8473	3.928037
8404	3.924486	8439	3.926291	8474	3.928088
8405	3.924537	8440	3.926342	8475	3.928139
8406	3.924589	8441	3.926393	8476	3.928190
8407	3.924641	8442	3.926445	8477	3.928242
8408	3.924692	8443	3.926496	8478	3.928293
8409	3.924744	8444	3.926548	8479	3.928344
8410	3.924796	8445	3.926599	8480	3.928396
8411	3.924847	8446	3.926651	8481	3.928447
8412	3.924899	8447	3.926702	8482	3.928498
8413	3.924950	8448	3.926753	8483	3.928549
8414	3.925002	8449	3.926805	8484	3.928600
8415	3.925054	8450	3.926856	8485	3.928651
8416	3.925105	8451	3.926908	8486	3.928703
8417	3.925157	8452	3.926959	8487	3.928754
8418	3.925208	8453	3.927010	8488	3.928805
8419	3.925260	8454	3.927062	8489	3.928856
8420	3.925312	8455	3.927113	8490	3.928907
8421	3.925363	8456	3.927165	8491	3.928958
8422	3.925415	8457	3.927216	8492	3.929010
8423	3.925466	8458	3.927267	8493	3.929061
8424	3.925518	8459	3.927319	8494	3.929112
8425	3.925569	8460	3.927370	8495	3.929163
8426	3.925621	8461	3.927421	8496	3.929214
8427	3.925673	8462	3.927473	8497	3.929265
8428	3.925724	8463	3.927524	8498	3.929316
8429	3.925776	8464	3.927575	8499	3.929367
8430	3.925827	8465	3.927627	8500	3.929418
8431	3.925879	8466	3.927678	8501	3.929470
8432	3.925930	8467	3.927729	8502	3.929521
8433	3.925982	8468	3.927780	8503	3.929572
8434	3.926033	8469	3.927832	8504	3.929623
8435	3.926085	8470	3.927883	8505	3.929674

Num	Logarith.	Num	Logarith.	Num	Logarith.
8506	3. 929725	8641	3. 931508	8576	3. 933284
8507	3. 929776	8542	3. 931559	8577	3. 933435
8508	3. 929827	8543	3. 931610	8578	3. 933386
8509	3. 929878	8544	3. 931661	8579	3. 933436
8510	3. 929929	8545	3. 931712	8580	3. 933487
8511	3. 929980	8540	3. 931762	8581	3. 933537
8512	3. 930031	8547	3. 931813	8582	3. 933588
8513	3. 930082	8548	3. 931864	8583	3. 933639
8514	3. 930133	8549	3. 931915	8584	3. 933689
8515	3. 930184	8550	3. 931966	8585	3. 933740
8516	3. 930235	8551	3. 932016	8586	3. 933790
8517	3. 930286	8552	3. 932067	8587	3. 933841
8518	3. 930337	8553	3. 932118	8588	3. 933892
8519	3. 930388	8554	3. 932169	8589	3. 933942
8520	3. 930439	8555	3. 932220	8580	3. 933993
8521	3. 930490	8556	3. 932270	8591	3. 934043
8522	3. 930541	8557	3. 932321	8592	3. 934094
8523	3. 930592	8558	3. 932372	9593	3. 934144
8524	3. 930643	8559	3. 932423	8594	3. 934195
8525	3. 930694	8560	3. 932473	8595	3. 934245
8526	3. 930745	8561	3. 932524	8590	3. 934295
8527	3. 930796	8562	3. 932575	8597	3. 934346
8528	3. 930847	8563	3. 932625	8598	3. 934397
8529	3. 930898	8564	3. 932676	8599	3. 934447
8530	3. 930949	8565	3. 932727	8600	3. 934498
8531	3. 930999	8566	3. 932778	8601	3. 934548
8532	3. 931050	8567	3. 932828	8602	3. 934599
8533	3. 931101	8568	3. 932879	8603	3. 934649
8534	3. 931152	8569	3. 932930	8604	3. 934700
8535	3. 931203	8670	3. 932980	8605	3. 934750
8536	3. 931254	8571	3. 933031	8606	3. 934808
8537	3. 931305	8672	3. 933082	8607	3. 934851
8538	3. 931356	8573	3. 933132	8608	3. 934902
8539	3. 931407	8574	3. 933183	8609	3. 934952
8540	3. 931457	8575	3. 933234	8610	3. 935003

Num	Logarith.	Num	Logarith.	Num	Logarith.
8611	3. 935053	8646	3. 936818	8681	3. 938569
8612	3. 935104	8647	3. 936865	8682	3. 938619
8613	3. 935154	8648	3. 936915	8683	3. 938669
8614	3. 935204	8649	3. 936965	8684	3. 938719
8615	3. 935255	8650	3. 937016	8685	3. 938769
8616	3. 935305	8651	3. 937066	8686	3. 938819
8617	3. 935356	8652	3. 937116	8687	3. 938869
8618	3. 935406	8653	3. 937166	8688	3. 938919
8619	3. 935456	8654	3. 937216	8689	3. 938969
8620	3. 935507	8655	3. 937267	8690	3. 939019
8621	3. 935557	8656	3. 937317	8691	3. 939069
8622	3. 935608	8657	3. 937367	8692	3. 939119
8623	3. 935658	8658	3. 937417	8693	3. 939169
8624	3. 935708	8659	3. 937467	8694	3. 939219
8625	3. 935759	8660	3. 933517	8695	3. 939269
8626	3. 635809	8661	3. 937568	8696	3. 939319
8627	3. 635859	8662	3. 937618	8697	3. 939369
8628	3. 935910	8663	3. 937668	8698	3. 939419
8629	3. 935960	8664	3. 937718	8699	3. 929469
8630	3. 936010	8665	3. 637768	8700	3. 939519
8631	3. 936061	8666	3. 937818	8701	3. 939569
8632	3. 936111	8667	3. 937868	8702	3. 939619
8633	3. 936162	8668	3. 937918	8703	3. 939669
8634	3. 936212	8669	3. 937969	8704	3. 939719
8635	3. 936262	8670	3. 938019	8705	3. 939768
8636	3. 936312	8671	3. 938069	8706	3. 939818
8637	3. 936362	8672	3. 938119	8707	3. 939868
8638	3. 936413	8673	3. 938169	8708	3. 939918
8639	3. 936463	8674	3. 938219	8709	3. 939968
8640	3. 936513	8675	3. 938269	8710	3. 940018
8641	3 .936564	8676	3. 938319	8711	3. 940068
8642	3. 936614	8677	3. 938369	8712	3. 940117
8643	3. 936664	8678	3. 938419	8713	3. 940167
8644	3. 936714	8679	3. 948469	8714	3. 940217
8645	3. 936765	8680	3. 938519	8715	3. 940267

Num	Logarith.	Num	Logarith.	Num	Logarith.
8716	3.940317	8751	3.942057	8786	3.943791
8717	3.940367	8752	3.942107	8787	3.943840
8718	3.940416	8753	3.942156	8788	3.943800
8719	3.940466	8754	3.942206	8789	3.943939
8720	3.940516	8755	3.942256	8790	3.943988
8721	3.940566	8756	3.942305	8791	3.944938
8722	3.940616	8757	3.942355	8792	3.944087
8723	3.940665	8758	3.942404	8793	3.944137
8724	3.940715	8759	3.942454	8794	3.944186
8725	3.940765	8760	3.942504	8795	3.944235
8726	3.940815	8761	3.942553	8796	3.944285
8727	3.940865	8762	3.942603	8797	3.944334
8728	3.940914	8763	3.942652	8798	3.944384
8729	3.940964	8764	3.942752	8799	3.944433
8730	3.941014	8765	3.942701	8800	3.944482
8731	3.941064	8766	3.942801	8801	3.944532
8732	3.941113	8767	3.942851	8802	3.944581
8733	3.941163	8768	3.942900	8803	3.944630
8734	3.941213	8759	3.942950	8804	3.944680
8735	3.941262	8770	3.942999	8805	3.944729
8736	3.941312	8771	3.943049	8806	3.944778
8737	3.941362	8772	3.943198	8807	3.944828
8738	3.941412	8773	3.943148	8808	3.944877
8739	3.941461	8774	3.943197	8809	3.944926
8740	3.641511	8775	3.943247	8810	3.944975
8741	3.941561	8776	3.943296	8811	3.945025
8742	3.941610	8777	3.943346	8812	3.945074
8743	3.941660	8778	3.943395	8813	3.945123
8744	3.941710	8779	3.943445	8814	3.945173
8745	3.941759	8780	3.943494	8815	3.945222
8746	3.941809	8781	3.943544	8816	3.945271
8747	3.941859	8782	3.943593	8817	3.945320
8748	3.941908	8783	3.943642	8818	3.945370
8749	3.941958	8784	3.943692	8819	3.945419
8750	3.942008	8785	3.943741	8820	3.945468

Num	Logarith.	Num	Logarith.	Num	Logarith.
8821	3. 945517	8856	3. 947237	8891	3. 948950
8822	3. 945567	8857	3. 947286	8892	3. 948999
8823	3. 945616	8858	3. 947335	8893	3. 949048
8824	3. 945665	8859	3. 947384	8894	3. 949097
8825	3. 945714	8860	3. 947433	8895	3. 949146
8826	3. 945763	8861	3. 947482	8896	3. 949194
8827	3. 945813	8862	3. 947531	8897	3. 949243
8828	3. 945862	8863	3. 947580	8898	3. 949292
8829	3. 845911	8864	3. 947629	8899	3. 949341
8830	3. 945950	8865	3. 947678	8900	3. 949390
8831	3. 946009	8866	3. 947727	8901	3. 949438
8832	3. 946059	8867	3. 947776	8902	3. 949487
8833	3. 946108	8868	3. 947825	8903	3. 949536
8834	3. 946151	8869	3. 947874	8904	3. 949585
8835	3. 946206	8870	3. 947923	8905	3. 949633
8836	3. 946255	8871	3. 947972	8906	3. 949682
8837	3. 946304	8872	3. 948021	8907	3. 949731
8838	3. 936354	8873	3. 948070	8908	3. 949780
8839	3. 946403	8874	3. 948119	8909	3. 949829
8840	3. 946452	8875	3. 948168	8910	3. 949877
8841	3. 946501	8876	3. 948217	8911	3. 949926
8842	3. 946550	8877	3. 948266	8912	3. 949975
8843	3. 946599	8878	3. 948315	8913	3. 950023
8844	3. 946648	8879	3. 948364	8914	3. 950072
8845	3. 946697	8880	3. 948413	8915	3. 950121
8846	3. 946746	8881	3. 948461	8916	3. 950170
8847	3. 946796	8882	3. 948510	8917	3. 950218
8848	3. 946845	8883	3. 948559	8918	3. 950267
8849	3. 946894	8884	3. 948608	8919	3. 950316
8850	3. 946943	8885	3. 948657	8920	3. 950364
8851	3. 946992	8886	3. 948706	8921	3. 950413
8852	3. 947041	8887	3. 948755	8922	3. 950462
8853	3. 947090	8888	3. 948804	8923	3. 950510
8854	3. 947139	8889	3. 948852	8924	3. 950559
8855	3. 947188	8890	3. 948901	8925	3. 950608

Num	Logarith.	Num	Logarith.	Num	Logarith.
8926	3.950656	8961	3.952356	8996	3.954049
8927	3.950705	8962	3.952404	8997	3.954097
8928	3.950754	8963	3.952453	8998	3.954146
8929	3.950802	8964	3.952501	8999	3.954194
8930	3.950851	8965	3.952550	9000	3.954242
8931	3.950900	8966	3.952598	9001	3.954290
8932	3.950948	8967	3.952647	9002	3.954339
8933	3.950997	8968	3.952695	9003	3.954387
8934	3.951045	8969	3.952744	9004	3.954435
8935	3.951094	8970	3.952792	9005	3.954483
8936	3.951143	8971	3.952840	9006	3.954531
8637	3.951191	8972	3.952889	9007	3.954580
8938	3.951240	8973	3.952937	9008	3.954628
8939	3.951288	8974	3.952986	9009	3.954676
8940	3.951337	8975	3.953034	9010	3.954724
8941	3.951386	8976	3.953082	9011	3.954773
8942	3.951434	8977	3.953131	9012	3.954821
8943	3.951483	8978	3.953179	9013	3.954869
8944	3.951531	8979	3.953228	9014	3.954917
8915	3.951580	8980	3.953276	9015	3.954965
8946	3.951623	8981	3.953324	9016	3.955013
8947	3.951677	8982	3.953373	9017	3.955062
8948	3.951726	8983	3.953421	9018	3.955110
8949	3.951774	8984	3.953469	9019	3.955150
8950	3.951823	8985	3.953518	9020	3.955206
8951	3.951871	8986	3.953566	9021	3.955254
8952	3.951920	8987	3.953614	9022	3.955302
8953	3.951968	8988	3.953663	9023	3.955351
8954	3.952017	8989	3.953711	9024	3.955399
8955	3.952065	8990	3.953759	9025	3.955447
8956	3.952114	8991	3.953808	9026	3.955495
8957	3.952162	8992	3.953856	9027	3.955543
8958	3.952211	8993	3.953904	9028	3.955591
8959	3.952259	8994	3.953952	9029	3.955639
8960	3.952308	8995	3.954001	9030	3.955687

Num	Logarith.	Num	Logarith.	Num	Logarith.
9031	3.955735	9066	3.957415	9101	3.959089
9032	3.955785	9067	3.957463	9102	3.959136
9033	3.955832	9068	3.957511	9103	3.959184
9034	3.955880	9069	3.957559	9104	3.959232
9035	3.955928	9070	3.957607	9105	3.959279
9036	3.955976	9071	3.957655	9106	3.959327
9037	3.956024	9072	3.957703	9107	3.959375
9038	3.956072	9073	3.957750	9108	3.959423
9039	3.956120	9074	3.957798	9109	3.959470
9040	3.966168	9075	3.957846	9110	3.959518
9041	3.956216	9076	3.957894	9111	3.959566
9042	3.956264	9077	3.957942	9112	3.959613
9043	3.956312	9078	3.957990	9113	3.959669
9044	3.956360	9079	3.958038	9114	3.959701
9045	3.946468	9080	3.958085	9115	3.959756
9046	3.956456	9081	3.958133	9116	3.959804
9047	3.956504	9082	3.958181	9117	3.959852
9048	3.956552	9083	3.958229	9118	3.959889
9049	3.956600	9084	3.958277	9119	3.959947
9050	3.956648	9085	3.958324	9120	3.959994
9051	3.956696	9086	3.958372	9121	3.960042
9052	3.956744	9087	3.958420	9122	3.960092
9053	3.956792	9088	3.958468	9123	3.960137
9054	3.956840	9089	3.958516	9124	3.960185
9055	3.956888	9090	3.958563	9125	3.960232
9056	3.956936	9091	3.958611	9126	3.960280
9057	3.956984	9092	3.958659	9127	3.960328
9058	3.957032	9093	3.958707	9128	3.960375
9059	3.957080	9094	3.958754	9129	3.960423
9060	3.957128	9095	3.958802	9130	3.960470
9061	3.957176	9096	3.958850	9131	3.960518
9062	3.957224	9097	3.958898	9132	3.960561
9063	3.957272	9098	3.958945	9133	3.960613
9064	3.957319	9099	3.958993	9134	3.960661
9065	3.957367	9100	3.959041	9135	3.960708

Num	Logarith.	Num	Logarith.	Num	Logarith.
9136	3.960756	9171	3.962416	9206	3.964071
9137	3.960803	9172	3.962464	9207	3.964118
9138	3.960851	9173	3.962511	9208	3.964165
9139	3.960898	9174	3.962558	9209	3.964212
9140	3.960946	9175	3.962606	9210	3.964259
9141	3.960993	9176	3.962653	9211	3.964306
9142	3.961041	9177	3.962700	9212	3.964353
9143	3.961088	9178	3.962748	9213	3.964401
9144	3.961136	9179	3.962795	9214	3.964448
9145	3.961183	9180	3.962842	9215	3.964495
9146	3.961231	9181	3.962890	9216	3.964542
9147	3.961278	9182	3.962937	9217	3.964589
9148	3.961326	9283	3.962984	9218	3.964636
9149	3.961373	9184	3.963031	9219	3.964683
9150	3.961421	9185	3.963079	9220	3.964730
9151	3.961468	9186	3.963126	9221	3.964778
9152	3.961516	9187	3.963273	9222	3.964825
9153	3.961563	9188	3.963221	9223	3.964872
9154	3.961610	9189	3.963368	9224	3.964919
9155	3.961658	9190	3.963315	9225	3.964966
9156	3.961705	9191	3.963362	9226	3.965013
9157	3.961753	9192	3.963410	9227	3.965060
9158	3.961800	9193	3.963457	9228	3.965107
9159	3.961848	9194	3.963504	9229	3.965154
9160	3.961895	9195	3.963551	9230	3.965201
9161	3.961942	9196	3.963599	9231	3.965248
9162	3.961990	9197	3.963646	9232	3.965295
9163	3.962037	9198	3.963693	9233	3.965342
9164	3.962089	9199	3.963740	9234	3.965389
9165	3.962132	9200	3.963787	9235	3.965436
9166	3.962179	9201	3.963835	9236	3.965483
9167	3.962227	9202	3.963882	9237	3.965530
9168	3.962274	9203	3.963929	9238	3.965578
9169	3.962322	9204	3.963976	9239	3.965625
9170	3.962369	9205	3.964023	9240	3.965672

Num	Logarith.	Num	Logarith.	Num	Logarith.
9241	3.965719	9276	3.967360	9311	3.968996
9242	3.965766	9277	3.967407	9312	3.969043
9243	3.965813	9278	3.967454	9313	3.969089
9244	3.965859	9279	3.967501	9314	3.969136
9245	3.965906	9280	3.967548	9315	3.969182
9246	3.965953	9281	3.967584	9316	3.969229
9247	3.966000	9282	3.967641	9317	3.969276
9248	3.966047	9283	3.967688	9318	3.969322
9249	3.966094	9284	3.967735	9319	3.969369
9250	3.966141	9285	3.967781	9320	3.969415
9251	3 966188	9286	3.967828	9321	3.969462
9252	3.966235	9287	3.967875	9322	3.969509
9253	3.966282	9288	3.967922	9323	3.969555
9254	3.966329	9289	3.967969	9324	3.969602
9255	3.966376	9290	3.968015	9325	3.969648
9256	3.966423	9291	3.968062	9326	3.969695
9257	3.966470	9292	3.968109	9327	3.969742
9258	3.966517	9293	3.968155	9328	3.969788
9259	3.966564	9294	3.968202	9329	3.969835
9260	3.966611	9295	3.968249	9330	3.969881
9261	3.966657	9296	3.968296	9331	3.969928
9262	3.966704	9297	3.968342	9332	3.969974
9263	3.966751	9298	3.968389	9333	3.970021
9264	3.966798	9299	3.968436	9334	3.970067
9265	3.966845	9300	3.968482	9335	3.970114
9266	3.966892	9301	3.968529	9336	3.970160
9267	3.966939	9302	3.968576	9337	3.970207
9268	3.966986	9303	3.968623	9338	3.970252
9269	3.967032	9304	3.968669	9339	3.970300
9270	3.967079	9305	3.968716	9340	3.970346
9271	3.967126	9306	3.968763	9341	3.970393
9272	3.967173	9307	3.968809	9342	3.970439
9273	3.967220	9308	3.968856	9343	3.970486
9274	3.967267	9308	3.968903	9344	3.970532
9275	3.967313	9310	3.968949	9345	3.970579

Num	Logarith	Num	Logarith.	Num	Logarith
9346	3.970625	9381	3.972249	9416	3.973866
9347	3.970672	9382	3.972295	9417	3.973912
9348	3.970718	9383	3.772341	9418	3.973958
9349	3.970765	9384	3.972388	9419	3.974004
9350	3.970811	9385	3.972434	9420	3.974050
9351	3.970858	9386	3.972480	9421	3.974097
9352	3.970904	9387	3.972526	9422	3.974143
9353	3.970950	9388	3.972573	9423	3.974189
9354	3.970997	9389	3.972619	9404	3.974235
9355	3.971043	9390	3.972665	9425	3.974281
9356	3.971090	9391	3.972711	9426	3.974327
9357	3.971136	9392	3.972758	9427	3.974373
9458	3.971183	9393	3.972304	9428	3.974419
9359	3.971229	9394	3.972850	9429	3.974465
9360	3.971275	9395	3.972896	9430	3.974511
9361	3.971322	9396	3.972943	9431	3.974557
9362	3.971368	9397	3.972989	9432	3.974603
9363	3.971415	9398	3.973035	9433	3.974649
9364	3.971461	9399	3.973081	9434	3.974695
9365	3.971507	9400	3.973127	9435	3.974741
9366	3.971554	9401	3.973174	9436	3.974787
9367	3.971600	9402	3.973220	9437	3.974834
9368	3.971646	9403	3.973266	9438	3.974880
9369	3.971693	9404	3.973312	9439	3.974926
9370	3.971739	9405	3.973358	9440	3.974972
9371	3.971785	9406	3.973405	9441	3.975018
9372	3.971832	9407	3.973451	9442	3.975064
9373	3.971878	9408	3.973497	9443	3.975110
9374	3.971924	9409	3.973543	9444	3.975156
9375	3.971971	9410	3.973589	9445	3.975202
9376	3.972017	9411	3.973635	9446	3.975247
9377	3.972063	9412	3.973681	9447	3.975293
9378	3.972110	9413	3.973728	9448	3.975329
9379	3.572156	9414	3.973774	9449	3.975385
9380	3.972202	9415	3.973820	9450	3.975431

Num	Logarith.	Num	Logarith.	Num	Logarith.
9451	3.975477	9486	3.977083	9521	3.978682
9452	3.975523	9487	3.977128	9522	3.978728
9453	3.975569	9488	3.977174	9523	3.978773
9454	3.975615	9489	3.677220	9524	3.978819
9455	3.975661	9490	3.977296	9525	3.978865
9456	3.975707	9491	3.977312	9526	3.978910
9457	3.975753	9492	3.977357	9527	3.978956
9458	3.975799	9493	3.977403	9528	3.979001
9459	3.975845	9494	3.977449	9529	3.979047
9460	3.975891	9495	3.977495	9530	3.979092
9461	3.975937	9496	3.977540	9531	3.979138
9462	3.975982	9497	3.977586	9532	3.979184
9463	3.976028	9498	3.977632	9533	3.979229
9464	3.976074	9499	3.977677	9534	3.979275
9465	3.976120	9500	3.977723	9535	3.979320
9466	3.976166	9501	3.977769	9536	3.979366
9467	3.976212	9502	3.977815	8537	3.979411
9468	3.976258	9503	3.977860	9538	3.979457
9469	3.976304	9504	3.977906	9539	3.979502
9470	3.976350	9505	3.977952	9540	3.979598
9471	3.976395	9506	3.977997	9541	3.979593
9472	3.976441	9507	3.978043	9542	3.979639
9473	3.976487	9508	3.978089	9543	3.979684
9474	3.976533	9509	3.978134	9544	3.979730
9475	3.976579	9510	3.978180	9545	3.979775
9476	3.976625	9511	3.978226	9546	3.979821
9477	3.976670	9512	3.978271	9547	3.979866
9478	3.976716	9513	3.978317	9548	3.979912
9479	3.976762	9514	3.978363	9549	3.979957
9480	3.976808	9515	3.976408	9550	3.980003
9481	3.976854	9516	3.978454	9551	3.980048
9482	3.976899	9517	3.978500	9552	3.980094
9483	3.976945	9518	3.978545	9553	3.980139
9484	3.976991	9519	3.978591	9554	3.980185
9485	3.977037	9520	3.978636	9555	3.980230

Num	Logarith.	Num	Logarith.	Num	Logarith.
9556	3.980276	9591	3.981863	9626	3.983445
9557	3.980321	9592	3.981909	9627	3.983491
9558	3.980367	9593	3.981954	9628	3.983536
9559	3.980412	9594	3.981999	9629	3.983581
9560	3.980452	9595	3.982045	9630	3.983626
9561	3.980503	9590	3.982090	9631	3.983671
9562	3.680548	9597	3.982135	9632	3.983716
9563	3.980594	9598	3.982180	9633	3.983761
9564	3.980639	9599	3.982226	9634	3.983806
9565	3.980685	9600	3.982271	9635	3.983851
9566	3.980730	9601	3.982316	9636	3.983896
9567	3.980775	9602	3.982361	9637	3.983941
9568	3.980821	9603	3.982406	9638	3.983986
9569	3.980866	9604	3.982452	9639	3.984032
9570	3.980911	9605	3.982497	9640	3.984077
9571	3.980957	9606	3.982542	9641	3.984122
9572	3.981002	9607	3.982587	9642	3.984167
9573	3.981048	9608	3.982633	9643	3.984212
9574	3.981093	9609	3.982678	9644	3.984257
9575	3.981138	9610	3.982723	9645	3.984302
9576	3.981184	9611	3.982768	9646	3.984347
9577	3.981229	9612	3.982813	9647	3.984392
9578	3.981274	9613	3.982858	9648	3.984437
9579	3.981320	9614	3.982904	9649	3.984482
9580	3.981365	9615	3.982949	9650	3.984527
9581	3.981410	9616	3.982994	9651	3.984572
9582	3.981456	9617	3.983039	9652	3.984617
9583	3.981501	9618	3.983084	9653	3.984662
9584	3.981546	9619	3.983129	9654	3.984707
9585	3.981592	9620	3.983175	9655	3.984752
9586	3.981637	9621	3.983220	9656	3.984797
9587	3.981682	9622	3.983265	9657	3.984842
9588	3.981728	9623	3.983310	9658	3.984887
9589	3.981773	9624	3.983355	9659	3.984932
9590	3.981818	9625	3.983400	9660	3.984977

Num	Logarith.	Num	Logarith.	Num	Logarith.
9661	3.985022	9696	3.986592	9731	3.988157
9662	3.985067	9697	3.986637	9732	3.988202
9663	3.985112	9698	3.986682	9733	3.988246
9664	3.985156	9699	3.986727	9734	3.988291
9665	3.985201	9700	3.986771	9735	3.988336
9506	3.985246	9701	3.986816	9736	3.988380
9667	3.985291	9702	3.986861	9737	3.988425
9668	3.985336	9703	3.986906	6738	3.988469
9669	3.985381	9704	3.986950	9739	3.988514
9670	3.985426	9705	3.986995	9740	3.988559
9671	3.985471	9706	3.987040	9741	3.988603
9672	3.985516	9707	3.987085	9742	3.988648
9673	3.985561	9708	3.987129	9743	3.988692
9674	3.985606	9709	3.987174	9744	3.988737
9675	3.985651	9710	3.987219	9745	3.988781
9676	3.985695	9711	3.987264	9746	3.988826
9677	3.965740	6712	3.987308	9747	3.988871
9678	3.985785	9713	3.987353	9748	3.988915
9679	3.985830	9714	3.987398	9749	3.988960
9680	3.985875	9715	3.987442	9750	3.989004
9681	3.985920	9716	3.587487	9751	3.989049
9682	3.985965	9717	3.987532	9742	3.989093
9683	3.986009	9718	3.987576	9753	3.989138
9684	3.986054	9719	3.987621	9754	3.989182
9685	3.986099	9720	3.987666	9745	3.989227
6686	3.986145	9721	3.987710	9756	3 989271
9687	3.686189	9722	3.987755	9757	3.989316
9688	3.986234	9723	3.987801	9758	3.989360
9689	3.986279	9724	3.987844	9759	3.989405
9690	3.986323	9725	3.987889	9760	3.989449
9691	3.986368	9726	3.987934	9761	3.989494
9692	3.986413	9727	3.987978	9762	3.989538
9693	3.986458	9728	3.988023	6763	3.989583
9694	3.986503	9729	3.988068	9764	3.989627
6695	3.986547	9730	3.988122	9765	3.689672

Num	Logarith.	Num	Logarith.	Num	Logarith.
9766	3. 989716	9801	3. 991270	9836	3. 992818
9767	3. 989761	9802	3. 991314	9837	3. 992862
9768	3. 989805	9803	3. 991359	9838	3. 992906
9769	3. 989850	9804	3. 991403	9839	3. 992951
9770	3. 989894	9805	3. 991447	9840	3. 992995
9771	3. 989939	9806	3. 991491	9841	3. 993039
9772	3. 989983	9807	3. 991536	9842	3. 993083
9773	3. 990027	9808	3. 991580	9843	3. 993127
9774	3. 990072	9809	3. 991624	9844	3. 993171
9775	3. 990116	9810	3. 991669	9845	3. 993215
9776	3. 990161	9811	3. 991713	9846	3. 993259
9777	3. 990205	9812	3. 991757	9847	3. 993303
9778	3. 990250	9813	3. 991801	9848	3. 993348
9779	3. 990294	9814	3. 991846	9849	3. 993392
9780	3. 990338	9815	3. 991890	9850	3. 993436
9781	3. 990383	9816	3. 991934	9851	3. 993480
9782	3. 990427	9817	3. 991978	9852	3. 993524
9783	3. 990472	9818	3. 992023	9853	3. 993568
9784	3. 990516	9819	3. 992067	9854	3. 993612
9785	3. 990560	9820	3. 992111	9855	3. 993656
9786	3. 990605	9821	3. 992155	9856	3. 993700
9787	3. 990649	9822	3. 992199	6857	3. 993744
9788	3. 990694	9823	3. 992244	9858	3. 993788
9789	3. 990738	9824	3. 992288	9859	3. 993832
9790	3. 990782	9825	3. 992332	9860	3. 993876
9791	3. 990827	9826	3. 992376	9861	3. 993921
9792	3. 990871	9827	3. 992421	9862	3. 993965
9793	3. 990915	9828	3. 992465	9863	3. 994009
9794	3. 990960	9829	3. 992509	9864	3. 994053
9795	3. 991004	9830	3. 992553	9865	3. 994097
9796	3. 991048	9831	3. 992597	9866	3. 994141
9797	3. 991093	9832	3. 992641	9867	3. 994185
9798	3. 991137	9833	3. 992686	9868	3. 994229
9799	3. 991181	9834	3. 992730	9869	3. 994273
9800	3. 991226	9835	3. 992774	9870	3. 994317

Num	Logarith.	Num	Logarith	Num	Logarith
9871	3.994361	9900	3.995898	9941	3.997430
9872	3.994405	9907	3.995942	9942	3.997473
9873	3.994449	9908	3.995989	9943	3.997517
9874	3.994493	9909	3.996026	9944	3.997561
9875	3.994537	9910	3.996073	9945	3.997604
9876	3.994581	9911	3.996117	9946	3.997648
9877	3.994625	9912	3.996161	9947	3.997692
9878	3.994669	9913	3.996205	9948	3.997735
9879	3.994713	9914	3.996248	9949	3.997779
9880	3.994756	9915	3.996292	9950	3.997823
9881	3.994800	9916	3.996336	9951	3.997866
9882	3.994844	9917	3.996380	9952	3 997910
9883	3.994888	9918	3.996424	9953	3.997954
9884	3.994932	9919	3.996467	9954	3.997997
9885	3.994976	9920	3.996511	9955	3.998041
9886	3.995020	9921	3.996555	9956	3.998084
9887	3.995064	9922	3.996599	9957	3.998128
9888	3.995108	9923	3.996643	9958	3.998172
9889	3.995152	9924	3.996686	9959	4.998215
9890	3.995196	9925	3.996730	9960	3.998259
9891	3.995240	9926	3.996774	9961	3.998302
9892	3.995284	9927	3.996818	9962	3.998346
9893	3.995328	9928	3.996861	9963	3.998390
9894	3.995371	9929	3.996905	9964	3.998433
9895	3.995415	9930	3.996949	9965	3.998477
9896	3.995459	9931	3.996993	9966	3.998520
9897	3.995503	9932	3.997036	9967	3.998564
9898	3.995547	9933	3.997084	9968	3.968608
9899	3.995591	9934	3.997122	9969	3.998651
9900	3.995635	9935	3.997167	9970	3.998695
9901	3.995679	9936	3.997211	9971	3.998738
9902	3.995722	9937	3.997255	9972	3.998782
9903	3.995766	9938	3.997299	9973	3.998825
9904	3.995810	9939	3.997342	9974	3.998869
9905	3.995854	9940	3.997386	9975	3.998912

Num	Logarith.	Num	Logarith.	Num	Logarith.
9976	3. 998956	9986	3. 999391	9996	3. 999826
9977	3. 999000	9987	3. 999435	9997	3. 999869
9978	3. 999043	9988	3. 999478	9998	3. 999913
9979	3. 999097	9989	3. 999522	9999	3. 999956
9980	3. 999130	9990	3. 999565	10000	4. 000000
9981	3. 999174	9991	3. 999609		
9982	3. 996217	9992	3. 999652		
9983	3. 996261	9993	3. 999695		
9984	3. 999304	9994	3. 999739		
9985	3. 999348	9995	3. 999782		

Place this Leaf at the latter end of the Tables of Logarithms.

THE

THE DESCRIPTION *and* USE OF THE *Logarithmical* TABLE OF PROPORTION.

The TABLE *deſcribed.*

THE *Table* contains the firſt Ten *Chiliads* of the *Logarithms*, of all *Abſolute Numbers* from One to Ten Thouſand. In each Page of the Table are contained Six Rows or Columns. In the Firſt, the Third, and the Fifth (towards the Left Hand) are contained all *Abſolute Numbers*, beginning at 1, and ſo on by 2, 3, 4, 5, 6, *&c.* to 10000, (having the word *Num.* at the head of each Column) which is the laſt Number in the Table.

Then, in the Second, Fourth and Sixth Rows or Colums of every Page, are contained the *Proportional* or *Logarithmical Numbers*, anſwering to each *abſolute Number*, againſt which it ſtandeth, and theſe Columns have at the head of them the word *Logarith.*

The Numbers being thus diſpoſed in the ſeveral Pages of the Table, it is eaſie to find what *Proportional* or *Logarithmical Number* anſwers to any *abſolute Number* that ſhall be required. Or, on the contrary, if any *Proportional* or *Logarithmical Number* be given, it will be eaſie to find the *abſolute Number* to which it belongeth.

For, if you find your *abſolute Number* in any Column of the Table, (under the Title [*Num.*] That Number that ſtandeth in the next Column to it, on the Right Hand, under the Title [*Logarith.*] is the *Proportional* or *Logarithmical Number* thereunto belonging.

And on the contrary, In what part of the Table ſoever you find any *Proportional* or *Logarithmical Number*, that Number which ſtandeth in the next Column on the Left Hand thereof, is the *abſolute Number* belonging to that *Logarithmical Number* ſo found.

And note further, That all the *Logarithmical Numbers* between 1 and 10, have a Cypher before them thus, 0; All Numbers between 10 and 100, have the Figure 1 before them, thus, 1; All Numbers between 100, and 1000, have the Figure

Figure 2 before them, thus 2; And all Numbers between 1000 and 10000, have the Figure of 3 before them, thus 3.

And, that what I have here delivered may be made plain, I ſhall give Examples thereof in the two following Propoſitions.

PROP. I.

Any Abſolute Number *being given, how to find the* Logarithmical *or* Proportional Number *thereunto belonging.*

LEt it be required to find the *Proportional* or *Logarithmical Number* belonging to 17. Turn to the Table, and in the Firſt Column of the firſt Page thereof, you ſhall find 17 under the word [*Num.*] and right againſt it, towards the Right Hand you ſhall find this Number, 1,230449 which is the *Logarithm* thereof. In like manner, in the ſame Page you ſhall find 45 under [*Num.*] againſt it, if you find 1,653212, which is the *Logarithm* thereof. Again, in the ſecond Page of the Table, if you look for the Number 136, under the [*Num*] againſt it you ſhall find 2,133539, which is the *Logarithm* thereof. And this courſe you are to obſerve through the whole Table, and ſo ſhall you find, that

The *Logarithm* of $\left\{\begin{matrix}6\\48\\456\\6782\end{matrix}\right\}$ will be $\left\{\begin{matrix}0,77815\\1,68124\\2,63948\\3,83135\end{matrix}\right.$

And by the Converſe of what is here delive-red, you may find the *Abſolute Number* anſwering to any given *Logarithm*, as in the following.

PROP. II.

A Logarithmical *or* Proportional Num-ber *being given, to find the* Abſolute Number *thereunto belonging.*

LEt it be required to find the *Abſolute Numbe* belonging to the *Logarithm* 1,230449 Look in the Table, and in the firſt Page thereo and caſting your Eye down among the Number under the word [*Logar.*] you ſhall find this Num-ber to ſtand juſt againſt 17; or you ſhall find 1 to ſtand on the left hand of it; wherefore 17 the *Abſolute Number* belonging to this *Logarithm* In like manner, if the *Abſolute Number* belongin to this *Logarithm* 1,653212, were required; ſee for this Number under the word [*Logar.* and on the left Hand of it you ſhall find 45 whic

which is the *Abſolute Number* thereunto belonging. Again, 136 will be found to be the *Abſolute Number* belonging to this *Logarithm* 2,133539. And by the ſame Method you may find, that

The *Abſolute Number* anſwering to	0,778151 1,681242 2,639486 3,831358	will be found to be	6 48 436 6782

And ſo of all other Numbers compriſed in this Table, which are all Numbers under 10000.

Caution.

But when you have a *Logarithmical Number* given, (which when you look for) you cannot find it in the *Table*, you muſt then take the neareſt Number thereunto, and the *Abſolute Number* which ſtands againſt it, is the neareſt whole Number, which you muſt take; For, to inſtance in *Fractions*, I ſhall at this time forbear to ſhew, we having no uſe thereof in this following Treatiſe. But thus for the

Abſolute Number anſwering to this *Logarithm*	0,632587 1,382114 2,690003 3,886201	you muſt take	4 24 486 7605

And ſo of all others. And let this ſuffice, for the Deſcription, now follows

THE *USE* of the *TABLE.*

I. *In* ARITHMETICK.

TO pass by *Addition* and *Substraction* of whole Numbers, as being a thing common to all Men; I shall proceed to *Multiplication*, *Division*, the Extracting of the *Square* and *Cube-Roots*, and working of the *Rule* of *Proportion*, as being such parts of *Arithmetick*, which tend wholly to the matter intended in this Book. And therefore I shall begin with

MULTIPLICATION By the Tables.

To perform *Multiplication* by the the Table, you must add *Logarithms* of the two Numbers to be Multiplied together, and the Sum of them will be the *Logarithm* of the Number produced by that *Multiplication.*

Example

Example 1.

Let it be required to *Multiply* 43 by 25.

First, Set down the two Numbers to be Multiplied one under the other, as 43 and 25, and by the ſide of them ſet their reſpective *Logarithm*,	43 —— *Log.* 1,633468 25 —— *Log.* 1,397940 1075 —— *Log.* 3,031408

ſo the *Log.* of 43 is 1,633468, the *Logarithm* of 25 is 1,397240, which being added together, the Sum of them is 3,031408, which *Logarithm* being found in the Table, the *abſolute Number* anſwering thereunto, is 1075; and ſo much is the Product of 43, being Multiplied by 25.

Example 2.

Let it be required to Multiply 163 by 48.

Set the Numbers down, as in the Margin, to find the *Log.* of 163, which is 2.212187, and ſet it down by it;	163 —— *Log.* 2.212187 49 —— *Log.* 1.681241 7824 —— *Log.* 3.393428

Alſo look the *Logar.* of 48, which is 1.681241, theſe two added together, produce 3.893428, the *abſolute Number* belonging to this *Logarith.* will be found to be 7824, and ſo much is the Product of 163 Multiplied by 48.

Example 3.

Let it be required to Multiply 202 by 31.

The Numbers being ſet down, and the reſpective *Logarithms* by them, and added together, the Sum of them is 3,796712, the Number anſwering thereunto, is 6262; and ſo much is the Product of 202 being Multiplied by 31.

202—*Logar.*—2,305351
31—*Logar.*—1,491361
6262—*Logar.*—3,796712

DIVISION

By the Tables.

As *Multiplication* by the Tables was performed by *Addition*, ſo *Diviſion* by the Table is performed by *Subſtraction*. Wherefore to perform *Diviſion*, you muſt *Subſtract* the *Logarithm* of the Number by which you are to Divide from the *Logarithm* of the Number which is to be Divided, and the Number which Remains, ſhall be the *Logarithm* of the Quotient.

Example 1.

Example 1.

Let it be required to Divide 1075, by 43.

First, Set down 3,031408 the *Log.* of 1075, the Number to be Divided) and under it ſet 1,633468, the *Logarithm* of 43, the Number by which you are to Divide. Secondly, *Subſtract* the leſſer from the greater, and the Remainer will be 1,397940. Which *Logarithm* being found in the Table, the *Abſolute Number* anſwering thereunto, is 25, which is the Quotient, and ſo many times is 43 contained in 1075.	1075—*Log.*—3,031408 43—*Log.*—1,633468 25—*Log.*—1,397940

Example 2.

Let it be required to Divide 7824 by 48.

Set the Numbers and the *Logarithms* proper to them, down as in the Margin, then Subſtract the *Logar.* of 48, from the *Log.* of 7824, and there will remain 2,212187, the *Logarithm* of 163, and that is the Quotient of that Diviſion, and ſo many times is 48 contained in 7824.	7824—*Log.*—3,893428 48—*Log.*—1,681241 163—*Log.*—2,212187

Example 3.

Example 3.

Let it be required to *Divide* 6262 by 202.

6262 —— *Logar.* 3.796712
202 —— *Logar.* 2.305351

31 —— *Logar.* 1.491361

Set the Number and their reſpective *Logarith.* by them or in the Margin; then Subſtract the *Logar.* of the leſſer Number, from the *Logar.* of the greater Number, and the Remainder will be 1.491361, the abſolute Numbering whereunto is 31, and ſo much will the *Quotient* of 6262 being Divided by 202 be, as in the Margin it is plain.

To Extract the *SQUARE & CUBE-ROOTS* By the TABLES.

I. *Of the* SQUARE-ROOT.

THe *Square-Root* is *Extracted* by taking half of the *Logarithm* of the *Given Number* whoſe *Root* is required, for the *Logarithm* Remaining ſhall be the *Logarithm* of the *Root* ſought.

Example 1.

Let it be required to find the *Square-Root* of 4356.

Set down the *Logarithm* thereof, which is 3.639088, and take the half thereof, which is 1.89544, the Abſolute Number anſwering to this *Logarithm* is 66, and that is the *Square-Root* of 4356.

4357. *Logar.*	3.639088
the half.	1.819544

Example

Example 2.

Let the *Square Root* of 9409 be required.

Set down the *Log.* thereof, which is 3,973543, and take the half thereof, which is 1,986771.

9409—*Log.*—3,973543
the half.—1,986771

The *Absolute Number* answering to to this *Logarithm* is 97, and that is the *Square Root* of 9409.

Example 3.

If 66 be a *Root* given, what is the *Square* thereof?

Set down the *Logarithm* of the *Root* given, 66, which is 1,819544, and double the same, the Sum is 3,639088, the *Absolute Number* answering thereto, is 4356, and that is the *Square Number*, of which 66 is the *Root*.

66—*Logar.*—1,819544—*Root.*
4356—*Logar.*—3,369088—*Square.*

II. Of the

CUBE ROOT.

AS the *Square Root* was obtained by *Partition*, or Dividing by 2. The *Cube Root* muſt be obtained by *Tripartition*, or Dividing by 3.

Example 1.

Let it be required to Extract the *Cube Root* of 4913.

Firſt, Find the *Logarithm* of 4913, which is 3,691346, and take a third part thereof, which is 1,230449, the *Abſolute Number* anſwering to this *Logarithm*, is the *Cube Root* ot 4913, and will be found to be 17. As followeth in the *Example*.

4913 — *Logar.* — 3,691346 — *Cube.*
17 — *Logar.* — 1,230449 — *Root.*

Example 2.

Wl at is the *Cube Root* of 729?

The

The Logarithm of 729 is 2,862727, one third part whereof is 0,954242, and the *absolute Number* answering thereunto is 9. So is 9 to the *Cube-Root* of 729, as followeth.

729 —— *Logar.* —— 2,862727 —— *Cube.*
9 —— *Logar.* —— 0,954242 —— *Root.*

Example 3.

Let 17 be a *Cubick Number* given, whose *Root* is required.

First, Set down the *Logarithm* of the *Root* given, namely 17, and *Multiply* it by 3, the Product will be 3.691347, whose Absolute Number is 4913, which is the *Cube* of 17, as in the *Example.*

17 —— *Log.* 1.230449 *Root*
4913 —— *Log.* 3.691347 *Cube*

To work the RULE of PROPORTION, Commonly called The GOLDEN-RULE, By the TABLE.

THE *Rule* of *Proportion*, is to find a fourth Number to any three proportional Numbers given; And to work any Queſtion in this Rule direct, you muſt, *Set down the* Logarithms *of the three* Proportional Numbers *in order one under another, then add the ſecond and third* Logarithms *together, and from their Sum* Subſtract *the firſt* Logarithm, *and the remainder ſhall be the* Logarithm *of that Number, which anſwers the* Queſtion.

Example 1.

If 45 Ells of Cloth coſt 30 *l.* what ſhall 84 Ells of the ſame coſt?

Firſt, Set down the Logarithm of 45, and under it the Logarithm of 30, and under that the Logar. of 48, in the ſame manner as here is done;

If

If 45 Ells——45 *Log.*——1,653212

Coſt 30 Pound—30 *Log.*—— 1,477121
What 84 Ells —84 *Log.*—— 1,924279

Sum of the ſecond and third—3,401400
Firſt Number being Subſtracted, leaves— } —1,748188

Secondly, Add the ſecond and third *Logarithms* together, and their Sum is 3,401400, from which Subſtract the firſt *Logarithm*, *viz.* 1,653212, and the Remainer will be 1,748188: which is the *Logarithm* of 56, and ſo many *l.* will 48 Ells coſt.

Example 2.

If One Pound of any Commodity coſt 1 s. 2 d. 3 q. *or three farthings, what ſhall* 112 l. *or* C. *Groſs of that Commodity coſt?*

If 1 *l.* —— *Log.* —— 1 —— 0,000000

Coſt 63 *far. Log.* — 63 —— 1,799340
What 112 *l. Log.* —112 —— 2,049218

Sum of the ſecond and third—3,848558

Set down the Numbers as above, then Add the ſecond and third *Logarithms* together, their Sum is 3,848558, from which the firſt *Logarithms* ſhould

ſhould be Subſtracted, but ſeeing that is 0.000000 the Logarithm ſtill remains as it is, and is the Logarithm of 7056, and ſo many Farthings will 112 *l.* coſt.

Now to know how many Shillings is contained in this 7056 Farthings. You muſt Subſtract the Logarithm of 48 (which is the number of Farthings in one Shilling.)

Which is——————1.681241
From the *Logar.* of 7056 —— 3.848558

The Remainer will be——————2.167217

Which is the Logarithm of 147, and ſo many Shillings will 112 *l.* coſt.

In the working of the *Rule of Three* by theſe Tables, you are to obſerve, that if the Third Number be greater than the Firſt, the Fourth Number will be leſs than the Second; you muſt add the Logarithms of the Firſt and Second Numbers together, and from the Sum of them Subſtract the Logarithm of the Third, and the Remainer ſhall be the Logarithm of the Number which anſwers the Queſtion, as in the Examples following.

Example 3.

If 60 Bricklayers *can make a Wall containing any Number of* Rods *in* 45 *days, how many days will* 40 Bricklayers *be a building of the like Wall?*

First, Set down the Numbers orderly as you ſee done in the Example following. Then add the Logarithm of 60, and the Logarithm of 45 together, their Sum will be 3.431363, from which Subſtract the Logarithm of 40, and there will remain 1.329303, the neareſt Logarithm to which being found in the Table, is 18260748, whoſe Abſolute Number is 67; and ſo many days will 40 *Bricklayers* be about the ſame Wall: And on the contrary, if the Third Number be leſs than the Firſt, the Fourth Number will be greater than the Second;

By the *Example* it is plain,

If 60 *Bricklayers* — *Log.* 60 — 1.778151
require 45 days — *Log.* 45 — 1.653212

What 40 *Bricklayers* — *Log.* 40 — 1.602060

The Sum of the Firſt and Second — 3.431363
The Third *Logar.* Subſtracted — 1.829303

The neareſt Abſolute Number anſwering to this Logarithm is 67, and ſo many days will 40 *Bricklayers* be about the ſame piece of work that 60 would have done in 45 days.

Example 4.

If a Cloſe will Graize 210 *Horſes* 6 *days, how many Horſes will the ſame Cloſe Graize for* 7 *days?*

Set

Set the Numbers down as followeth

If 6 days —— *Log.* —— 0.778151
210 Horſes — *Log.* 210 — 2.322219

What 7 days — 7 *Log.* — 0.845098

Sum of the Firſt and Second — 3.100370
The Third *Logar.* being Subſtracted, leaves —— 2.255272

Which is the Logarithm of 180, and ſo many Horſes will the ſame Cloſe Graize for 7 days.

THE MENSURATION OF *Plain Geometrical Figures* By the TABLE.

I. *To Meaſure a* Geometrical Square.

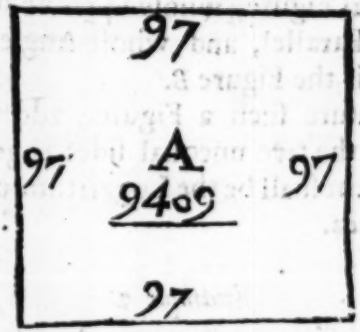
A *Geometrical Square* is ſuch a Figure whoſe 4 ſides are all equal, and whoſe 4 Angles are all right Angles, as is the Figure *A*.

To Meaſure ſuch a Square, ſet down the Logarithm of the ſide of the Square twice, and add them together, the Sum ſhall be the Logarithm of the Area or Content.

Example.

Example.

Let the side of the Square *A* be 97, what is the Area thereof?



Set down the Logarithm of 97 twice, and add them together, the Sum of them is 3.973542, which is the Logarithm 9409, and that is the Area or Content of that *Geometrical Square* whose side is 97. As by the Work appears.

97——*Log.*——1.986771
97——*Log.*——1.986771

9409——*Log.*——3.973542

Thus if the side of the Square had been 97 { Inches / Feet / Yards / Pole or Rods } The Content would have been 9409. { Inches / Feet / Yards / Rods, *&c.*

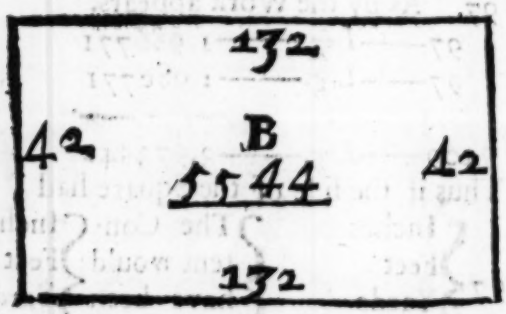
II. *To Measure the* Long-Square, *or* Parallelogram.

A *Long-Square* or *Parallelogram* is a Geometrical Figure, whose oppoſite ſides are equal, and Parallel, and whoſe Angles are right Angles, as is the Figure *B*.

To Meaſure ſuch a Figure, add the Logarithms of the two unequal ſides together, the Sum of them ſhall be the Logarithm of the Content or Area.

Example 2.

Let the Length of the *Long-Square* or *Parallelogram* be 132, and the Breadth thereof 42. What is the Content?



Add

Add the Logarithm of 42, to the Logarithm of 132, the Sum of them is 3.743823, which is the Logarithm of 5544, and that is the Area of the *Parallelogram.*

See the Work,

Length	132	*Log.*	2.120574
Breadth	42	*Log.*	1.623249
Content	5544	*Log.*	3.743823

Thus if the *Long-Square B* were a piece of Land, and ſhould contain 132 Perches in Length, and 42 Perches in Breadth, the Content would be found to be 5544 Perches — Now to know how many Acres this Piece is,

Subſtract the Logarithm of 160 (becauſe there are 160 Perches in one Acre) out of the Logarithm of 5544, and there ſhall remain the Logarithm of the Content in Acres.

Thus,

	5544	*Log.*	3.743823
	150	*Log.*	2.204120
Acres	35 *fere*	*Log.*	1.539703

III. *To Measure any* Triangle.

A *Triangle* is a Geometrical Figure consisting of three Sides, and as many Angles, as is the Figure *C*. In which Triangle, and in all others (in this case) the longest side thereof is called the Base of the Triangle, and a right Line drawn from the Angle, opposite to the Base, is called the Cathetus or Perpendicular.

To Measure all sorts of Triangles, *There are Four ways, but principally Two,* viz.

1. The Logarithm of half the Base, being added to the Logarithm of the Perpendicular, giveth the Logarithm of the Area or Content.

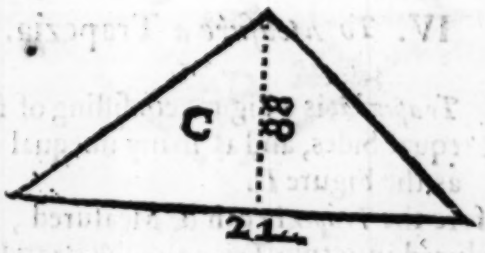
Or,

2. The Logarithm of half the Perpendicular, added to the Logarithm of the whole Base, giveth the Logarithm of the Area or Content.

Example.

Example.

In The Triangle *C*, Let the Baſe be 214, and the Perpendicular 88, and let the Area of the Triangle be required.



1, To the Logarithm of half the Baſe 107, add the Logarithm of the Perpendicular 88, the Sum of them is 3.973866, which is the Logarithm of 9416, and that is the Area or Content of the Triangle.

Half the Baſe	107	*Log.*	2.029384
Perpendicular	88	*Log.*	1.944482
Area	9416	*Log.*	3.973866

Or,

2. To the Logarithm of 214, the Whole Baſe add the Logarithm of 44 half the Perpendicular, the Sum will be 3.973866, and the Content 9416 as before.

The

The Base 214	—— *Log.* ——	2.330414
Half the Perp. 44.	—— *Log.* ——	1.643452
Area —— 9416	—— *Log.* ——	3.973866

IV. *To Measure a* Trapezia.

A *Trapezia*, is a Figure consisting of four unequal Sides, and as many unequal Angles, as the Figure *D*.

Before the *Trapezia* can be Measured, it must be reduced into two Triangles, by drawing of a Line from two opposite Angles thereof, which may be called the Common Base of both the Triangles; upon which Base, from the two opposite Angles, let fall two Perpendiculars. The Figure being thus reduced into two Triangles, may be measured as in the last foregoing Precept. But more readily the two following ways.

1. The Logarithm of the Sum of the two Perpendiculars being added to the Logarithm of the Area, or Content of the whole *Trapezia*.

Example.

Example.

In the *Trapezia D*, Let the Common Base be 102, and let One Perpendicular be 13, and the other 39. And let the Area be required.

The two Perpendiculars 13 and 39 added together, make 52, the Logarithm whereof is 1.716003, to which add 1.707570, the Logarithm of half the Base, the Sum of them is 1.423573, which is the Logarithm of 2652, and that is the *Area* of the *Trapezia*.

Sum of Perpend.	52	*Log.*	1.716003
Half the Base	51	*Log.*	1.707570
Area	2952	*Log.*	3.423573

Or,

2. To the Logarithm of the Base, add the Logarithm of half the Sum of the Perpendiculars, the Sum shall be the Logarithm of the Area, as in the Work.

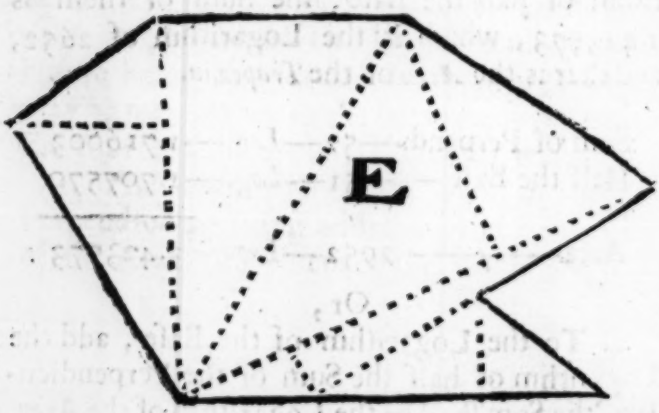
The

The whole Base —— 102—*Log.*—2.008600
Half Sum of Perpen.— 26—*Log.*— 1.414973

Area as before —— 2652—*Log.*—1.413573

V. *To Measure* Irregular, *or many sided Right Lined Figures.*

ALl Figures whose Sides are above 4, and whose Sides and Angles are unequal, must first be reduced into Trapezias and Triangles, and then must be Measured by the Rules of the two last foregoing Precepts: An Example whereof you have in the Figure noted *E*.



VI. *To*

VI. *To Measure* Regular Polygons.

Regular Polygons, are such Figures as consist of equal Sides and Angles, and which may be be inscribed in a Circle, and circumscribed about a Circle.

If the *Polygon* consist of	5	Sides, it is called a	*Pentagon*
	6		*Hexagon*
	7		*Septagon*
	8		*Octogon*
	9		*Nonagon*
	10		*Decagon*

Examples of all which you have in the following Figures, *F G H K L* and *M*.

The

Pentagon

Octagon

Hexagon

Nonagon

Septagon

Decagon

The { *Pentagon* / *Hexagon* / *Heptagon* } being inſcribed within the Circle.

And,

The { *Octogon* / *Nonagon* / *Decogon* } being circumſcribed about the Circle.

For the Menſuration of all theſe Regular Polygons, *there is one General Rule, and that is this.*

To the Logarithm of the Sum of half the Sides of the *Polygon*, add the Logarithm of the length of a Perpendicular let fall from the Centre of the Circle, to the middle of one of the Sides of the *Polygon*; the Sum ſhall be the Logarithm of the Area of the *Polygon*.

Example. In the *Pentagon* marked with the Letter *F*.

Let the Perpendicular be 14, and let one ſide of the *Polygon* be 24, and let the Area of the *Pentagon* be required.

The Side being 24, and there being 5 of them, the Perimeter of the Figure will be 120, the half whereof is 60. Wherefore add the Logarithm of 60, to the Logarithm of the Perpendicular 14, the Sum of them is 2.924279, and the abſolute Number anſwering thereunto, is 840, and ſo much is the Content of the *Pentagon F*, as by the work appears.

Semi-

Semiperimeter—60 *Log.*—1.778151
Perpendicular—14 *Log.*—1.146128

Area——840 *Log.*—2.924279

VII. *Of the* Circle.

1. *The* Diameter *being given, to find the* Circumference.

The Proportion is
As 7 is to 22.
So is the Diameter, to the Circumference.

Wherefore, to find the Circumference of any Circle whose Diameter is given. Add the Logarithm of the Diameter given, to the Logarithm of 22, and from the Sum of them Substract the Logarithm of 7, the Remainer shall be the Logarithm of the Circumference sought.

Example

If the Diameter of a Circle be 113, what is the Circumference?

First, set down the Logarithm of 22, to which Add the Logarithm of 113, the Diameter given, the Sum is 3.395500, from which Substract the *Logar.* of 7, and the Remainer will be 2.550402, which is the near Logarithm of 355. And so much is the Circumference of that Circle whose Diameter is 113.

See

See the Work.

22——*Log.*——1.342422
Diameter 113——*Log.*——2.053078

Sum——3.395500
7——*Log.*—— 0.845098

Circumference 355——*Log.* —— 2.550402

2. *The* Circumference *of a* Circle *being given, to find the* Diameter.

The Proportion is,
As 22 is to 7,
So is the Circumference to the Diameter.
Wherefore, To the Logarithm of 7, Add the Logarithm of the Circumference given, and from the Sum Subſtract the Logarithm of 22. The Remainer ſhall be the Logarithm of the Diameter.

Example.

If the Circumference of a Circle be 355, what is the Diameter thereof?

Firſt, Set down the Logarithm of 7, and to it Add the Logarithm of 355, the Circumference given, the Sum of them is 3.395326, from which Subſtract the Logarithm of 22, and the Remainer ſhall be 2.052904, which is the near Logarithm of 113, and ſo much is the Diameter of that Circle whoſe Circumference is 355.

7 —— *Log.* —— 0.845098
Circumference 355—*Log.* —— 2.550228

3.395326
22—*Log.* —— 1.342422

Diameter 113—*Log.* —— 2.052904

3. *The* Diameter *being given, to find the* Area *or* Superficial Content.

The Proportion is,
As 28 is to 22.
So is the Square of the Diameter to the Area:
Wherefore to the Logarithm of 22, Add the Logarithm of the Diameter doubled, (or twice) and from the Sum Subſtract the Logarithm of 28, the Remainer ſhall be the Log. of the Area.

Example

If the Diameter of a Circle be 12, what is the Area or Superficial Content thereof?

Firſt, Set down the Logarithm of 22, and then the Logarithm of 12 the given Diameter twice, and Add all three together, the Sum of them is 3.500784, from which Subſtract the Logarithms of 28, and there will remain 2.053626, which is the Logarithm of 113, and ſome ſmall matter more, and that is the Area of the Circle.

See the Work.

22 —— *Log.* —— 1.342422

Diameter 12 —— *Log.* twice { 1.079181 / 1.089181

The Sum 3.500784

28 —— *Log.* —— 1.447158

Area 113 —— *Log.* —— 2.053626

4. *The* Circumference *being given, to find the* Area.

The Proportion is,

As 88 is to 7.

So is the Square of the Circumference to the Area.

Wherefore to the Log. of 7, add the Logar. of the Circumference twice; and from the Sum Subtract the Log. of 88; the Remainer ſhall be the Logarithm of the Area.

Example.

If the Circumference of a Circle be 38, what is the Area thereof?

Firſt, Set down the Logarithm of 7, and to it Add the Logarithm of the Circumference twice, the Sum of them is 4.004664, from which Subtract the Logarithm of 88, and the Remainer will be 2.060181, which is the near Logarithm of 115. And ſo much is the Area of that Circle, whoſe Circumference is 38.

See the Work.

7——*Log.*——0.845098

Circumfer. 38——*Log.*——{1.579783 / 1.579783

Sum——4.004664

88——*Log.*——1.944483

Area 115——*fere*——2.060181

THE

THE *MENSURATION* OF *Board, Glaſs, Pavement,* *Wainſcot, Plaiſtering, Tyling.* and By the TABLE.

I. *Of* Board.

1. *If a* Board *be 9 Inches Broad, how much in height thereof muſt go to make a Foot ſquare?*

FRom the Logarithm of 144 (which is the Number of Square Inches in a Foot,) Subſtract the Logarithm of the Boards Breadth 9 Inches, the Remainer ſhall be the Logarithm of the length of a Foot Square.

144—*Log.*—2.158362
Breadth ——— 9—*Log.*—0.954242

Length of a Foot—16—*Log.*—1.284120

2. If a Board be 14 Inches broad, and 200 Inches long, how many Square Feet are contained in that Board?

Add the Logarithm of 14 the breadth, and the Logarithm of 200 the length together; and from their Sum Substract the Logarithm of 144, the Remainer shall be the Logarithm of the Content. So the Board of 14 Inches broad, and 200 Inches long, will contain 19 Feet, and somewhat more, *viz.* about $\frac{1}{5}$ a Foot.

Breadth	14	*Log.*	1.146128
Length	200	*Log.*	2.301030
Substract			3.447158
144		*Log.*	2.158362
Content in Feet	19	*Log.*	1.288796

In the working of Questions of this kind by the Logarithmical Tables, it is necessary that that measure what ever it be, whether Foot, Yard, Ell, Rod, or the like, be divided into 100 equal parts, and not the Foot into 12, as the usual manner is; And so the dimensions of any thing to be measured, must be thus taken and expressed. This being considered, I shall now proceed.

3. *A Board or Plank being 2 Foot, and 36 hundred parts of a Foot broad, and 17 Foot, and 63 hundred parts of a Foot long, how many Square Foot doth that Board contain?*

Add

Add the Logarithms of 2.36, and 17.63 together; the Sum of them ſhall be the Logarithm of the Content of the Board in Feet.

But here note,

You muſt, to theſe Logarithms of whole numbers and Parts mixed together, not put the ſame Characteriſtick (or Sign ſtanding before the Comma) that you find in the Table. But

If the Integer Fig. to be Multiplied, be in number		then the Characteriſtick muſt be	
	1		0
	2		1
	3		2
	4		3
	5		4

As in this Example.

	Foot.	Parts.		
Length	17	63	*Log.*	1.246252
Breadth	2	36	*Log.*	0.372912
Content	41	61	*Log.*	3.619164

Where you ſee that the two Log. 1.246252, and 0.372912 being added together, produce the Logarithm 3.619164, before which you muſt (or need) not prefix the Characteriſtick 1. but 3. the greateſt that this Table will afford; and then ſeeking the Logarithm 3.619164, in the Table you ſhall find it to ſtand againſt 41.61: ſo that the Board contains 41 Foot, and 61 hundred parts of a Foot.

4. *There is a Room whose Floor is* 16 *Foot* 75 *hundred parts broad, and* 32. 25 *Foot long; How many Square Feet are therein contained?*

Add the Logarithm of 16. 75, and the Logar. of 32.25 together, their Sum is (prefixing a proper Characteristick) 3.732543, the absolute number answering thereunto, is and so many Feet and parts of a Foot is contained in the Floor of that Room:

Breadth	16.75	*Log.*	1.224014
Length	32.25	*Log.*	1.508521
Content	540.02	*Log.*	3.732535

So that this Room contains in the Floor 540 Foot. and 20 hundred or 2 tenth parts of a Foot.

II. *Of Glass.*

1. *A Pane of Glass being* 1 *Foot* 32 *parts broad, and* 4.50 *parts long; how many Foot doth it contain?*

Add the Logar. of the length and breadth together, the Sum is the Log. of the content in Feet.

Example.

	Foot.		
Breadth	1.32	*Log.*	1.120574
Length	4.50	*Log.*	1.653212
Content	5.94	*Log.*	3.873786

So that this Pane of Glass contains 5 Foot, and 94 hundred parts of a Foot.

2. *A Pane of Glaſs is* .75 *parts of a Foot in breadth, and of theſe in one Window there is* 20, *and the height of each of them is* 2.5 *Feet; how much Glazing is there in this Window?*

Multiply .75 by 20. Thus.

.75	—— *Log.* ——	1.875061
.20	—— *Log.* ——	1.301030
Product —15.00	—— *Log.* ——	3.176091

The Product is 15 Foot for the common breadth: then the common height is 2.5 Feet. Wherefore Multiply 2.5 by 15, as followeth.

Common breadth—15.00	*Log.*—	1.176091
Height ——— 2.5	*Log.*—	1.397940
Content ——— 37.5	*Log.*—	2.574031

So that in the whole Window there is contained 37 Foot, and a half of Glazing.

III. *Of Pavement.*

There is a large Hall Paved with Marble, whoſe length is 132.2 *Foot, and the breadth* 56.8 *foot; how many ſquare Feet are contained therein?*

Add the Log. of the length, and the breadth together, prefixing proper Characteriſticks; the Content will be found to be 7508 Foot, and 9 tenth parts of a Foot, which is almoſt 7509 Foot, as in the *Example.*

Length—	132.2	—— *Log.* ——	3.121231
Breadth—	56.8	—— *Log.* ——	2.754348
Content—	7508.9	—— *Log.* ——	5 875579

If

If a Hall be 63 Foot long, and 28 Foot broad, how many ten Inch Tiles will Pave the same?

First, Add the Logar. of 63, and 28 together, their Sum is 3.246398, which is the Logarithm of 1764, and so many Square Feet are contained in the Hall. This number 1764 being Multiplied by 144, the number of Square Inches in one Foot, will produce 254016; and so many Square Inches are there in the Hall.

Now every Tile being 10 Inches Square, will Pave 100 Inches of the Hall; Wherefore, Divide 254016 by 100, (which is done by cutting off the two last Figures) and the Quotient will be 2540, and so many Tiles must there be to Pave this Hall, and 16 Inches of a Tile more.

IV. *Of Wainscoting.*

If a Room be 4 Yards, and 3 tenth parts of a Yard high, and 72 Yards and 5 parts about; how many Yards of Wainscoting is there in that Room?

To the Logarithm of the Girt about, add the Logarithm of the height; the Sum is 2.493806, the number answering thereto, is 3117 tenths; and so many Yards of Wainscoting is there in that Room.

Girt about	72.5	*Log.*	1.860338
Height	4.3	*Leg.*	1.633468
Content	311.1	*Log.*	3.493806

311-7/10

V. *Of*

V. *Of Plaistering.*

If a Cieling be 16 Yards long, and 9 Yards broad; how many Square Yards are contained in the Cieling?

To the Logarithm of the length, add the Log. of the breadth, and the Sum of them will be the Logarithm of the Content.

Length——16 *Log.*——1.204120
Breadth——9 *Log.*——0.954242

Content — 144 *Log.*——2.158362

But if the length and breadth be given in Feet, and the Content were required in Yards. As in this *Example.*

A Cieling is 48 Foot in length, and 27 Foot broad; how many Yards are there in this Cieling?

Add the Logarithms of 48 and 27 together, and from the Sum of them Substract the Logar. of 9, (becauſe 9 Feet are in one Yard) and the Remainer ſhall be the Logarithm of the Content in Yards. As in the following work.

Feet.

Length——48 *Log.*——1.681241
Breadth — 27 *Log.*——1.431363

Sum——3.112604
Logarithm of 9 Substract 0.954242

Content in Yards 144——2.158362

VI. *Of Tiling.*

There is a Roof whose length with the Barge Courses is 96 Foot, and whose length of Rafter with the Turnings and Eves-boards is 21 Foot; How many Square of Tiling will there be to cover this Roof?

First, Set down the Log. of the length 96, and then double the length of the Rafter, which is 21 Foot, and it makes 42; the Log. whereof add to the Log. of 96, and their Sum is the Log. of 4032; and so many Square Foot of Tiling will there be in that Roof, and being that 100 Foot goes to make one Square of Tiling; cut off the two last Figures with a dash of your Pen; so shall it be 40.32, that is 40 Square, and 32 Foot. And so much Tiling will there be in that Roof.

See the Work.

Length	96	*Log.*	1.982271
Rafters length double	42	*Log.*	1.623240
Content	4032	*Log.*	3.605511

Which divided by 100 is 40 Squire, and 32

THE

THE MENSURATION OF *SOLIDS.*

AS *TIMBER & STONE,* By the TABLE.

TImber and Stone are Meaſured by the Foot. Wherefore let the dimenſions be taken in Feet, and parts of a Foot.

1. *If a piece of Square Stone or Timber be 2 Foot broad, 3 Foot deep, and 46 Foot long; How many Solid Feet are contained in that Piece?*

Firſt, Set down the Logarithm of 2 the breadth, and to it add the Logarithm of 3 the depth; the Sum of them is 0.778151. To which Log. add the Logar. of 46 the length, and the Sum will be 2.440901, which is the Logarithm of 276; and ſo

ſo many Solid Feet are contained in this Piece of Timber.

See the Work.

Breadth	2	*Log.*	0.301030
Depth	3	*Log.*	0.477121
		Sum	0.778151
Length	46	*Log.*	1.662758
Content	276	*Log.*	2.440909

If a Piece of Stone or Timber be 35 Inches broad, and 42 Inches deep, and 32 Foot; (or 384 Inches long,) How many Solid Feet doth this Piece contain?

Firſt, Set down the Logarithm of the breadth 35, and to it add the Logarithm of the depth 42; and their Sum is 3,167308. To which add the Logarithm of the Length, 384; and the Sum of them is 5.751639. From this Logarithm Subſtract the Logarithm of 1728 (which is the number of Solid Inches contained in one Foot,) and the Remainer will be 2.514096, which is the Logarithm of 327 almoſt; and ſo many Feet are contained in that Piece of Timber.

See the Work.

Breadth	35	*Log.*	1.544068
Depth	42	*Log.*	1.623240
		Sum	3.167308
Leugth	384	*Log.*	2.584331
		Sum	5.751639
	1728	*Log.*	3.237543
Content	327 Foot *fere.*		2.514096

I might inſtance in divers other Examples of ſeveral kinds, which would rather make the Book Great, than uſeful; For whatſoever may be done by any Tables yet in being; (of this nature) may be performed by this. And for Regular Solids, and unequal ſided Board and Timber; all the precepts delivered in the foregoing parts of this Book, may be applied to the Table.

I need not ſay any thing more of the manifold uſes that this Table is ſubſervient unto; the which is ſo well known already to all Artiſts, and for other Artificers: the Precepts here delivered being general, they make uſe of it in almoſt any thing that concerns Mundane Affairs. And therefore, to the uſes of it in this place, I ſhall at this time put

An End.

AN APPENDIX.

Shewing the further Use of the foregoing Tables in two Particulars, (Viz.)

1. IN shewing how to find the Solid Content of a Piece of round Stone or Timber by Addition only.

And,

2. In *Gauging of Cask* by help of a Line or Rod of common Inches, each Inch being Divided into Ten equal parts.

All manner of Board, Glass, Stone, Timber, *&c.* may be measured by help of the Table, and the Uses of them in this Tract before delivered. But for variety, I shall add some for the Uses of the same Tables, whereby you shall find the Content or Solid Capacity of Round or Circular Solids, as Trees, Columns of Wood or Stone, *&c.* And also in the *Gauging of Cask*.

I. *How*

1. *How to Measure Round or Circular Solids.*

For the Measuring of these *Circular Solids*, this number is always to be had in remembrance; namely, [6.65772]

Having this number, set it down, then having taken the Diameter of the *Column* in Inches, set down the Logarithm thereof two times, under this constituted number; Lastly, set down the Logarithm of the length in Inches, and add all these four numbers together, the sum of their cutting off with your Pen (the last Figure toward your left hand) shall be the solidity of the Piece of *Stone*, or *Timber* required.

Example 1.

If a round Column or Pillar of Stone *or* Wood, *be* 35 *Inches Diameter, and the length of the same be* 364 *Inches, how much doth the Piece contain?*

1. Set down the constituted number		6,65772
2. The Log. of 35 Inches, the Diam.	35	1,54406
3. The same again		1,54406
4. The Log. of 364, the length	364	2,56210
The Logarithm of	203	2,30794

Which 203 is the nearest number in the Tables; and therefore the Column of Stone or Timber contains almost 203 Foot.

Example II.

If the Diameter of a round Column be 15 *Inches, and the length thereof be* 105 *Inches; how many ſolid Feet are contained in that Column?*

1. The conſtituted number ——— 6,65772
2. The Log. of the Diameter—15—1,17609
3. The ſame again ——— 15—1,17609
4. The Logar. of the length —105—2,02118
   The Logar. of ——— 10.74—1,03108

Which 10.74 is 10 Foot, and 74 hundred parts of a Foot; and ſo many Foot are contained in that Column of Stone or Timber, that is 10 Foot, and three quarters.

Note. If the Column, or Pillar, or other round body be not equal at both ends; take the Diameter about the middle thereof for a Mean.

The Uſe of the Tables in Gaging *of* Cask.

For the finding of the content of any Veſſel, three Lines muſt be firſt meaſured with a Rule, or Rod; namely,

1. The Diameter of the Heads.
2. The Diameter of the Bongs.
3. The length of the Veſſel.

And

And theſe three lengths muſt be meaſured by a Line of Inches, each Inch being divided into 10 parts, for that is the moſt convenient of any other. For in taking of your Dimenſions, if you put your Rod into the Bong of your Caſk, and put it to the bottom right there againſt, and find it 30 Inches deep, you need but add a Cipher thereunto, and it will be 300, and ſo are your Inches eaſily reduced into hundred parts. —But if the Diameter at the Bong had not been even Inches, as in the laſt, but it had been 30 Inches, and 6 tenth parts of an Inch; then inſtead of adding a Cypher to the 30, add a 6, ſo will the Diameter at the Bong be 306 parts, and ſo of any other number of parts.

Thus have you attained to the Diameter at the Bong. Now for the Diameter at the Head, taking the greateſt length without, and making an allowance (according to diſcretion) for the thickneſs of the ſame, which Diameter at the Head we will ſuppoſe to be 24 Inches, and 2 parts, that is reduced 242 parts.

Theſe two being attained, The next length or Meaſure, is, the length of the Caſk, which muſt be taken in the inſide of the Caſk between Head and Head, by means of ſome Inſtrument to ſlip in and out; and we will ſuppoſe this length to contain 50 Inches, 6 parts: And thus have you found

The Diameter at the Bong ——— 30.6
The Diameter at the Head ——— 24.2
The length of the Veſſel ——— 50.6

It reſteth now to find a mean Diameter between that of the Head, and that of the bong, which you may thus attain.

1. Add the Diameter of the Head, and the Diameter of the Bong together, and half of that ſum refer.

2. Take the difference between the Diameter of the Head and Bong, and add a fourth part thereof to the former reſerved nnmber; the ſum of thoſe ſhall be the Mean Diameter ſought.

Example in the foremention'd Cask.

The Diameter at the Head — 24.2
The Diameter at the Bong — 30.6

Their ſum ——— 54.8

Half their ſum —— 27.4 Reſerve.

The difference of the Diameters at Head and Bong — } 6.4
A fourth part thereof — 1.6

The Mean Diameter ——— 29.0

Being

Being thus prepared, you may attain to the content of the Cask, as followeth.

1. Set down the conſtituted number [453165.]
2. Set down the Logarithm of the Mean Diameter twice.
3. Set down the Logarithm of the length,
4. Add theſe three numbers together, and cutting off the firſt Figure towards your left hand, the reſt ſhall be the Logarithm of the content of the Veſſel.

Example.

Conſtituted number	4.53165
The Log. of the Mean Diameter, 290	2.46239
That again	2.46239
The Logarithm of the length—506	2.70415
The Logarithm of 144 neareſt	2.16058

So that the Cask contains 144 Gallons, and ſomewhat more, becauſe the Logarithm found, is greater than the Logarithm of 144. And how much more than 144 Gallons the Veſſel doth hold, you may thus find.

1. Take the difference between the Logarithm of 144 and 145, which you will find to be 300. this number muſt be your Diviſor.

2. Take the difference between the Logarithm of 144, and the Logarithm found, which you will find to be 222.

3. Multiply this 222 laſt found by 8, (for there be 8 Pints in one Gallon,) and the Product ſhall be 1776 for your Dividend.

4. This 1776 being divided by 300, giveth in the Quotient 6 *fere*; and ſo the content of the Veſſel is 144 Gallons, and 6 Pints almoſt.

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I. THE DESCRIPTION Of the *Line* of *Numbers*.

THis Line is nothing elſe but the foregoing Table of Logarithms projected upon a Rule; the manner how 'tis inſcribed thereon, is well known to the Inſtrument-maker, and therefore needs no diſcourſe thereof in this place.

You are to underſtand that this Line is vulgarly made after this form, *viz.* At the beginning thereof is placed the Figure of 1. and ſo proceeds from 1. to 2, and from 2. to 3. 4. 5. 6. 7. 8. 9. unto 1. again, placed in the middle of the Rule, which proceeds in the ſame order to the other end of the Rule, ending with 10.

This

This 1 at the beginning of the Rule ſometimes repreſents 1 only, and then that in the middle ſignifies 10. and that at the other end 100.

Again, if 1 at the beginning denotes 10. then 1 in the midſt is 100. and 1 at the end 1000. ſo that for any number under 1000. the Figures very readily direct you.

Note farther, as the whole Line is divided into 100 parts: ſo is each of thoſe parts ſubdivided into 10 parts more, or as the length thereof will permit, more or leſs, in decuple or tenfold order.

II. *Numeration or Notation upon the Line of Numbers.*

ANy Number under 1000 being given, to find the Point on the Line repreſenting the ſame.

Rule.

Make ſearch for the firſt figure of your number, amongſt the figured diviſions: In the next place, for your ſecond figure, count ſo many tenths from the long diviſions, forwards on, towards the end of the Rule, (*viz.* next the right hand) as the ſecond figure amounts unto; or if it be three figures, account from the laſt figure

ſo

ſo many centiſms as that figure hath units; and if there be four figures, you muſt make as near an eſtimation thereof in the ſame order, as you can by your eye, and the length of the Line will permit.

Example 1.

Let the number propoſed be 12. to find the point on the Rule repreſenting the ſame.

Here you ſee 1 is the firſt Figure, which I chuſe in the middle of the Rule, and by reaſon 2 is the ſecond figure, I count two tenths farther towards the right hand, and that is the place or point of 12 required; where 'tis frequent to have a braſs Center pin, by reaſon of its often uſe.

Example 2.

Suppoſe the point which repreſents 144 be required upon the Rule.

Here in this caſe I make choice of 1 in the middle for the firſt figure, and for 40 the ſecond figure I account 4 tenths forward, and for 4 the laſt, I reckon 4 Centiſms or 100 parts, which is the point deſired.

Example 3.

Again, admit I would find the point which repreſents 1728. the Cube Inches in a Foot Solid.

To perform this, I take 1 in the middle of the Line, for the ſecond figure 7 I account 7 tenths, which denotes 700. and for the third figure 2,

I reckon 2 Centiſms from the tenths, which repreſents 20, and for 8 make as near an eſtimation as you can for the thouſand part, (except your Line be long enough to have thoſe ſubdiviſions.)

This will be better underſtood by little practice than by many words, and to an ingenious headpiece cannot be difficult to apprehend.

III. *How to find a Fraction on the Line of Numbers.*

THeſe you are to note are expreſt upon the Line no otherwiſe than Decimal Fractions, as thus, *viz.*

$\frac{1}{10}$ $\frac{1}{100}$ $\frac{1}{1000}$ (or thus,

01 c01 0001 *&c.*

And thus you muſt underſtand them whether Inches, Feet, Yards, *&c.* and thus all other Fractions muſt be reduced into Decimals, and upon this conſideration they are expreſt as whole numbers upon the Line.

PROB.

PROB. I.

To multiply two Numbers given by the Line of Numbers.

THE Proportion is, As 1 is to the *Multiplicand*: ſo the *Multiplicator* to the *Product*.

RULE.

So that if you extend the Compaſſes from 1 to either of the Numbers to be multiplied, that extent will reach the ſame way from the other Number to the Product.

Example 1.

As 1 to 4: ſo 7 to what? Or,
As 1 to 8: ſo 5 to what?

Firſt, I extend my Compaſſes from 1 to 4, and that extent will reach from 7 the ſame way to 28; or from 1 to 7 will reach from 4 to 28.

And ſo the extent from 1 to 8, ſhall reach from 5 to 40, according to the ſame method.

Now if you are at a ſtand to know what number of places are contained in the *Product*: Note that the *Product* always contains as many figures as are in the *Multiplicand* and *Multiplicator* both; unleſs the two firſt figures of the *Product* be greater than the two firſt figures in the *Multiplicator*: if ſo, the *Product* muſt have one

one figure leſs than are in the *Multiplicator*, and *Multiplicand*.

Thus 47 multiplied by 25 is 1175, but 16 by 16 is 256, and conſiſts but of three places for the aforeſaid reaſon.

PROB. II.

To Divide one Number by another.

THe proportion is, As the *Diviſor* is to 1: ſo is the *Dividend* to the *Quotient*.

This is not much different from the work in Multiplication upon the Line, it being the converſe.

Example 2.

I would divide 40 by 5, therefore I extend the Compaſſes from the *Diviſor*, 8 to 1. The ſame extent will reach from the *Dividend* 40, the ſame way to 5 the *Quotient*.

But in greater Diviſions by the Line to know the number of figures in the *Quotient*, take this

RULE.

Note the difference of the number of places or figures in the *Dividend* and *Diviſor*, then in caſe the quantity of the two firſt figures to the left hand in your *Diviſor*, be leſs than the quantity of the two firſt figures to the left hand in your

your *Dividend*, the *Quotient* ſhall have one figure more than the number of difference: But where the quantity of the two firſt figures of the *Diviſor*, is greater than the quantity of the two firſt figures of the *Dividend*, the *Quotient* will will have only that number of figures noted by the difference. So 245 divided by 15. will have two figures in the *Quotient*; but divide 240 by 36, and there will be but one figure in the *Quotient*.

The uſe of the Line of Numbers, in meaſuring any ſuperficial Meaſure, as Board, Floors, Wainſcot, Glaſs, &c.

The common way of meaſuring is with a two foot Rule, divided into 24 equal Parts or Inches, each Inch being ſubdivided into halves, quarters, and half quarters, for the exact taking of dimenſions; but this is not ſo agreeable to the Line, as foot meaſure is, and therefore he that would meaſure by Mr. *Gunter*'s Line, ought to have a Line of foot meaſure upon his Rule, which is only a foot divided into 10 more ſmaller diviſions, and being thus prepared, you ſhall thereby eaſe your ſelf very much in your menſuration.

PROB.

PROB. III.

Having the breadth of any Superficies given in Inches, and the length in Feet, to find the Content in Feet.

Example 3:

LEt the breadth given be 25 Inches, and the length 19 foot 2 inches; extend the compasses from 12 to 25, the breadth in inches, and that extent will reach from 19 foot 2 inches the length, being once repeated upwards towards your right hand, to 40 foot, the content required.

PROB. IV.

Having the breadth and length of any Superficies given in Inches, to find the Content in Feet.

THe Proportion is, As 144 inches (the number of square inches in a superficial foot) is to the breadth in inches: so is the length in inches to the content in feet.

Example

Example 4.

Extend the Compaſſes from 144 to the breadth 25 Inches, and that extent will reach from 230 Inches the length, to 40 Foot the content as before.

PROB. V.

Having the breadth and length of any oblong Superficies given in Inches, to find the Content in Inches.

THE proportion is, As 1 Inch to the breadth in Inches: ſo is the length in Inches to the content in Inches.

Example 5.

Extend the Compaſſes from 1 in the middle of the Rule, to 25 Inches the breadth, and that extent will reach from 230 the length in Inches, to 5750 the content in Inches.

Now to bring theſe numbers of Inches into Feet, extend the Compaſſes from 1 in the middle of the Line, to 144, and that extent of the Compaſſes will reach from 5750 (the whole number of Inches) to 40 the content in Feet, as before, the Compaſſes before once turned downward towards the left hand.

PROB. VI.

How to meaſure any Superficies by the Line of Foot Meaſure, which is performed only by Multiplication.

ADmit a Board be 1 foot 5 tenths of a foot broad, and 20 foot long, how many feet are in ſuch a board?

Example 6.

Extend the Compaſſes from 1 in the middle of the Rule (or Line) which is 10, the ſide of a ſquare foot, to the fifth and longeſt diviſion, between 1 and 2. and that extent will reach from 20 foot the length, to 30 foot the content.

But if you would have the content in parts of a foot, you are to work thus: Extend the Compaſſes from 1 or 10 in the middle of the Rule to 15 the breadth, which is 1 foot 5 parts, and that extent will reach from 200, the number of parts in the whole, to 3000, which is the whole content in parts.

To bring this number of parts into feet, obſerve this Rule. Account how many hundreds or how many thouſands, ſo many ſquare feet is in that ſuperficies: or ſo many thouſands you have, ſo many 10 foot there is, which is but the ſame thing.

But

But if you measure board that is under a foot broad, then observe to turn the Compasses downwards towards your left hand.

Example 7.

Admit a board 9 inches broad, and 20 foot long; extend the Compasses from 12 to 9, the same extent will reach from 20 to 15, the content required.

To measure Glass, or any other Superficies, is in effect but the same thing.

Example 8.

Suppose I have a piece of Glass 18 Inches broad, and 40 Inches in length, extend the Compasses from 144 to 18 the breadth, and that extent will reach from 40 the length, to 5 foot the content. Or thus, by foot measure, extend the Compasses from 10 to 15, and that extent will reach from 35 the length, to 5 foot and a quarter, the content as before.

PROB. VIII.

Having the breadth and length of any Superficies, either Plaistering, Wainscot, Hangings, in Foot or Inch measure, to find how much in length countervails a superficial Foot in the same measure.

THe Rule is this, Divide 144 the superficial Inches of a Foot in inch measure, or 1000 the superficial Inches of a Foot in foot measure, by the breadth (*viz.* the height of your room taken in the same measure;) and the *Quotient* gives the number of Inches you are to measure forward for a square Foot, which upon the Line is thus performed: Admit the breadth given, 78 parts of a Foot, the extent from 78 to 1, shall reach from 1 to 1.28: so that 1 Foot and 28 parts in length, contains a superficial Foot at that breadth. And after the same manner in Inch measure, the breadth being given 14,25, (*viz.* a quarter) the length of a Foot will be found 10 Inches 1 tenth and a half; The same method is to be followed in measuring of Board, where note, if it be broader at one end than the other, you are to take the *Arithmetical mean*, *viz.* add the breadth of both ends together, and take half for a mean breadth.

And

And for measuring of Floors, Partitions, and such like, 'tis but multiplying the length by the breadth, and the *Product* gives the *Content* desired.

PROB. VIII.

There is a Roof which is 16 Foot a quarter broad, how much thereof makes a square, which is 10 Foot every way?

HEre if you divide 100 by 16, 25, the *Quotient* will be 7 and 15 parts, or rather 2 parts almost: so that if you extend your Compasses from 16 to 1, the same extent will reach from 1 to 6 and 2 parts *ferè*, and so much in length shall be an exact square.

PROB. IX.

There is a certain Yard to be paved, which is 17 Foot 33 parts broad, how much in length makes a Yard?

FOr this here is your Rule: Divide 9 the square Feet in a Yard, being increased by Cy-

phers at pleasure, by 17,33 the breadth, the *Quotient* gives 052, which is the length of one yard; so that if you extend the Compasses from 17,33 to 1, the same extent will reach from 9 the square feet in a yard, to 5. 2 parts *ferè* of a foot, accounted towards the left hand; and the *ferè* 5 parts of a foot and 2 tenths in length, contains a square yard.

PROB. X.

Admit there be a certain House tiled, whose breadth is 16 foot and a quarter, and length 47 foot, I would know how many squares of Tiling is contained therein.

I Double the length (thereby to take in both sides of the Roof) which amounts to 94, which multiplied by 16, 25 produces 1527, 5, this *Product* divided by 100, and the *Quotient* is 15 and 28 parts *ferè*, the content of the Tiling. Which is most easily performed by the Line on this manner: For first the extent from 1 to 94 will reach from 16,25 towards the left hand unto 15,27 and half, the *Product*; which to divide by 100 only cuts off 2 Figures as a Fraction towards the right hand, and the *Quotient* is 15 squares and 28 parts *ferè*, *viz.* a little above a quarter more.

PROB.

PROB. XI.

To find the Content or Area of a Triangle.

FIrſt you are to take the neareſt diſtance or length between the *Baſe* and oppoſite Angle, ſo having this perpendicular length, and the *Baſe* in any kind of meaſure, *viz.* foot or inch meaſure: Multiply the one into the other, and half the *Product* is the *Content*: or multiply half the *Baſe* by the whole *Perpendicular*, or the whole *Perpendicular* by half the *Baſe*, and the *Product* gives the *Content* deſired.

Example.

Thus having the hipt end of a Roof, 28 foot for the *Baſe*, and 12 foot for the *Perpendicular*, theſe drawn one into the other by the Rules of Multiplication, produces 336 feet, whoſe half is 168 feet for the *Content* deſired: or if you multiply half 28, the *Product* is the ſame. *And thus you may meaſure the Gable end of a Houſe, or the hipt end of a Roof.*

How to meaſure Irregular Superficies.

This is done by reducing them into *Trapeziums* and *Triangles*, which is largely ſhewn in the former part of this Book, and therefore I ſhall forbear ſpeaking any thing thereof.

But note, if you have an *Equilateral Triangle* to meaſure, *viz.* every ſide equal in length; you may meaſure it by this proportion: As 1 to 433. 013: ſo the ſide of the *Triangle* given in Feet and Inches, *&c.* to the *Content*, without finding a *Perpendicular*.

PROB. XII.

The Diameter of a Circle given, to find the Circumference by the Line.

SAy firſt, As 7 is to 22, or as 1 is to 3,14: ſo the *Diameter* to the *Circumference*: Thus ſuppoſe the *Diameter* be 12 Inches, the *Circumference* will be found 37 and 70 parts of an Inch almoſt; ſo that if you extend the Compaſſes from 7 to 22, or from 1 to 3,14, the ſame extent ſhall reach upon the Line from 12 to 37, and 70 parts almoſt; or if the *Diameter* were 20, the ſame extent will reach from thence to 63,

the

the true *Circumference* desired. Or having the *Circumference*, you may find the *Diameter*, if you say, As 22 to 7, or as 1 to 0,318: so the *Circumference* to the *Diameter*, which is wrought upon the Line in the same manner as the former.

Prob. XVIII.

Having the Diameter of a Circle to find the superficial content, and the Converse.

THe proportion is thus; say, As 14 to 11, or as 28 to 22, or as 1 to 079: so is the square of the *Diameter*, (which is only the *Diameter* multiplied into it self) to the *Area* or superficial *Content*.

Otherwise you may reason thus, As 1 is to 3, 14: so is the square of the *Radius* or *Semidiameter* to the *Content* as before.

So, for example, in the former *Circle* whose *Diameter* was 12, the *Content* will be found 113 and better. For if you extend the Compasses from 1 to 3,14, the same extent of the Compasses shall reach from 36 (the square of the *Semidiameter*) or from 144, the square of the whole *Diameter*, to 113 and better, the Area desired. In like manner the extent of the Compasses from 14 to 11, or 28 to 21, shall reach from

from 144 the ſame way downwards, to the *Content*, 113 as before.

Now the *Converſe* of this *Problem* is by changing the proportion, having the *Area* to find the *Diameter*; therefore ſay, as 11 to 14, or as 22 to 28 *&c.* So the *Area* to the ſquare of the *Diameter* deſired; and this is wrought in all reſpects like the former upon the Line.

And after this manner you may meaſure the *Content* of any Circular Form, as Glaſs, (which is often for ornament wrought in that Form of Circles) and here I may hint, that there is no neceſſity to expreſs all particular Forms that are to be meaſured in ſuperficial meaſure, ſince the former Rules are variouſly applicable.

PROB. XIV.

How to meaſure a ſquare Solid, as Timber, Stone, or ſuch like.

THe Rule is, firſt to find the *Area* of the *Baſe*, (or one of the ends in Inches) and multiply that into the length, gives the *Content* in Inches, which divided by 1728, the *Quotient* is the *Content*.

Example.

Admit the piece of Timber be 16 Inches ſquare,

ſquare, and 18 foot long, there will be found 32 foot in that ſolid: For extend the Compaſſes from 12, the ſide of a foot to 16 Inches the ſide given, the ſame *Extent* twice repeated ſhall reach to 32 the ſolid feet in that piece.

PROB. XV.

How to meaſure a piece of Timber by the Line whoſe ſides are unequal.

HAving the two ſides given, multiply one into the other, from which *Product* extract the ſquare *Root* (which is only to divide the ſpace between thoſe two numbers or ſides into two equal parts upon the Line, and the point of the Compaſſes falls upon the *Root* deſired; or having the *Product* of the two unequal ſides given, extend the Compaſſes from 1 to that *Product*, and the middle between thoſe two numbers is the *Root* required) thus having obtained the ſide of the true ſquare; extend the Compaſſes from that point to 12, the ſame *Extent* ſhall reach from the length to the *Content*, being twice repeated, as before in the other.

Example.

Admit one ſide be 13 Inches and the other 17, the middle way between theſe two numbers upon

upon the Line, falls upon 14,4 *ferè*, which is the *Root* of that *Product*, *viz.* of 221; that point ſo reſting, extend the other to 12, upon the Line, and that *Extent* being twice repeated, will reach from the length 19 Foot and a half, to the *Content* 30 Foot *ferè*. And thus a ſtone Peer may be meaſured according to the ſame method, or any other ſolid equivalent.

PROB. XVI.

Having the Area of the Baſe of a Solid, to find how much in length makes a Foot forward, &c.

IF the ſides be either equal or unequal, the *Area* is eaſily gotten by multiplying one ſide into the other; which *Product* is to be a *Diviſor*, and the *Dividend* 1. or 1000, *&c.* and the *Quotient* is the length of a Foot ſolid required.

Example.

Admit a piece of Timber be 1 Foot 75 parts or three quarters one way, and the other way be 1 Foot and 25 parts or a quarter, the *Rectangle* of theſe two will be 2 Foot 188 parts *ferè*; then I extend the Compaſſes upwards from 2,188.

to

to 1. and the ſame *Extent* of the Compaſſes will reach from 1 downwards, to 04,57 parts, and ſo that 4 parts and 57, forward upon that Solid, is equal to a Foot in Foot meaſure.

PROB. XVII.

How to meaſure a round Solid or Column, Cylinder or Pillar, &c.

TO perform this, take the *Diameter*, and by that find the *Area* of the *Baſe* or Circle at one end, *viz.* the *Content* in Inches, which multiplied by the length in Inches, gives the *Content* in Solid Inches, which divided by 1728 the Solid Inches in a Foot, the *Quotient* is the *Content* in Feet. Otherwiſe thus: having the *Area* or *Content* of the *Baſe* (as is before ſhewed *Prob.* 13.) find the ſquare *Root* thereof as before directed, and then 'tis reduced into an exact ſquare Solid, and meaſured in all reſpects as was ſhewed *Prob.* 14. and therefore Examples are needleſs: or if you would know how much in length makes a Foot, having the *Area* of the *Baſe*, work as you are directed in the laſt *Problem*, and you ſhall obtain your deſire.

PROB.

PROB. XVIII.

How to meaſure Square or Round Timber that is bigger at one end than the other.

THE Rule is thus: Firſt find the *Area* of both ends, (as is already ſhewed) which are uſually termed their *Baſes*, multiply theſe 2 *Baſes* one into the other, and extract the ſquare *Root* of that *Product*: again, add both the *Baſes* and this ſquare *Root* together, and multiply the ſum thereof by one third part of the length, and the *Product* will be the *Content* required.

As for Example.

Suppoſe a piece of Tapering Timber be 12 foot long, and 6 tenths, and the breadth of the *Baſe* at the greater end is 1 foot 3 quarters, or 75 parts, and the depth is 1 foot 32 parts, which multiplied together produces 2 foot 31 parts for the *Content* of the greater *Baſe*: Now the *Baſe* at the leſſer end is in breadth 1 foot 2 parts, and the thickneſs or depth ſuppoſe 91 parts of a foot; theſe two multiplied together, produce the leſſer *Baſe* 1 foot 092 hundred parts of a foot. Theſe two *Baſes* drawn into each other, produce 2,52252 the ſquare *Root* whereof is

1,588

1,588 and better; unto which add the ſum of both the *Baſes*, the *total* will be 4,99 which being multiplied by 1 third part of the height, *viz.* 4,2 the *Product* will be 20 foot and 96 parts *ferè*, the exact *Content* of the ſaid piece in foot meaſure.

This is ſomewhat tedious, I muſt confeſs, for Workmen in their practice; but I inſerted it the rather, becauſe tis 'an exact *Geometrical* and *demonſtrative* way, and the trueſt way for exact *Menſuration* of ſuch Solids: although for common ordinary Timber, that old way of taking the Compaſs or *Area* in the middle for a mean, may ſerve; and what is here mentioned of meaſuring theſe kind of Solids, which are the *Segments* of *Cones* and *Cylinders*, may alſo be underſtood in the *Menſuration* of Brewers Tuns, either round or ſquare.

PROB. XIX.

How to meaſure a round body, viz. *a Globe Sphere, or Ball, the Diameter thereof being given, which is eaſily obtained by help of a pair of Callepeers.*

THe proportion is as 41 to 22. or more vulgarly as 21 : 11, or if you pleaſe as 1 to 052,

c52, ſo is the *Cube* of the *Diameter* to the *Content* required.

Note, That the *Cube* is only the Diameter multiplied into it ſelf, and that *Product* multiplied again by the *Diameter*, produces the *Cube*: Thus a *Sphere* whoſe *Diameter* or *Axis* is 12 Inches, will be found to contain 905 Inches and 14 parts; For extend the Compaſſes from 21 to 11, the ſame will reach from 1728, the *Cube* of the *Diameter*, to 905 and better, *viz.* almoſt 906 Inches.

PROB. XX.

How to meaſure any Cask, Barrel, Pipe, Hogſhead, or other Veſſel, &c.

FIrſt take the *Diameter* at Bong in Inches and parts, alſo the *Diameter* at Head in the ſame meaſure, together with the length. Secondly, By the Rules before given find the *Area* of thoſe 2 Circles; having ſo done, take one third part of the *Area* at Head; and two third parts of the *Area* at Bong, and add them together: and thus your Veſſel is reduced into a *Cylinder*. Then multiply that Product by the length, it gives the *Content* in Solid Inches, which divided by 231 for Wine, 282 for Beer and Ale, gives the true *Content* in Wine or Ale Gallons. *Ex-*

Example.

Admit a Veſſel whoſe *Diameter* at head is 18 Inches, and at Bong 32, but the length 40 Inches; by the foregoing Rules one third of the *Area* of the Circle at Bung will be found 268,2, which doubled and added to the one third of the *Area* of the Circle at Head 84,9, the ſum will be 621,3 for the ſum of the mean *Cylinder*; which multiplied into the length 40. by the Line as before taught, produces the *Content* of the Cask or Veſſel in Solid Inches, *viz.* 24852, which divided by the Cube Inches of a Gallon of Wine 231, gives in the *Quotient*, as you may find by the Line according to the former Directions, 107 Gallons 58 parts, the true *Content* of the Cask required.

Having briefly ſhewed by theſe Twenty Problems *how to meaſure divers Superficies and Solids by the help of* Gunter's *Line, or the Line of Numbers: in the next place I ſhall add ſome few practical eaſie* Queſtions, *as a further variety for Workmen and ſo conclude my* Supplement.

Queſtion I.

There is a Floor which contains in length 17 Foot 8 Inches, and breadth 16 Foot 6 Inches; I would know how many ſuperficial Feet is contained therein.

But before I ſhew the manner of work, let theſe things be obſerved.

Firſt, you are to note that *feet* multiplied into *feet*, produce ſquare *feet*.

Secondly, *Inches* multiplied into *inches*, produces ſquare *inches*, or long *inches* and ſquare *inches*, provided the *Product* amounts to above 12.

Thirdly, Note that 12 ſquare *inches* make 1 long *inch*, and 12 long *inches* make one ſuperficial *foot*.

Fourthly, *Feet* multiplied by *inches*, or *inches* by *feet*, produce long *inches*, or *feet* and long *inches*, if the *Product* be above 12.

This being premiſed, *Multiplication* of *feet* and *inches* without *Reduction*, and ſo all Queſtions depending thereon, may eaſily be performed thus, As for example, in the aforeſaid Queſtion 17 *foot* 8 *inches* by 16 *foot* 6 *inches*. I place them thus one under another, as you ſee:

	17	8
	16	6

Then

Then I begin and multiply 16 by 17, according to the Vulgar Rules of *Multiplication*, and the *Product* ſtands thus:

	102
	17
	272 : 0
Secondly, I multiply croſs	08 : 6
17 by 6, for which I ſay 17	10 : 8
halves is 8 and a half, which	00 : 4
I alſo ſet down in order, and	
likewiſe 16 by 8 croſs; or	291 : 6 *Product.*
rather for eaſe of memory,	

ſay 16 halves is 8 *foot*, and then 16 times 2 that remains, is 32 long *inches*, that is 2 *foot* 8 long *inches*; this added to the former 8 *feet*, produces 10 *feet* 8 long *inches*, which I alſo ſet down under 8 *foot* 6 *inches*, as in the Margin.

Laſtly, I multiply 6 by 8, which is 48 ſquare *inches*, that is 4 times 12, therefore 4 long *inches*, which 4 I place under 8, and add them all together, beginning at the right hand, ſtill carrying the twelves to the next place, and ſo the *Product* will be 291 ſquare *feet*, and 6 long *inches* or half a foot more. After the ſame manner you are to work in all ſuch like caſes.

Or if this were to be reduced into ſquares, then 'twould be 291 ſquare *feet* and a half; or if into ſquare yards, by dividing by 9, the ſquare *feet* in a yard, the *Quotient* would be 32 yards and 3 tenths of another, *viz.* a little above a quarter.

So if I were to multiply 19 *feet* 5 *inches*, by 11 *foot* 7 *inches*, the *Product* would be found 224 ſquare feet 10 *long inches* and 11 *ſquare inches*, that is, very near 225 *feet:* and the work will ſtand thus, according to the Rules laid down.

19——5
11——7

f.	*l.*	*in.*	*ſq.in.*
19			
19			
209	0	0	
9	6	0	
1	7	0	
4	7	0	
0	2	11	
224	10	11	

Queſtion II.

I. *There are two party Walls in a Cellar which are each of them* 29 *foot long, theſe two added together amount to* 58 *feet in length, which multiplied into the height* 7 *foot produces* 406 *feet at two bricks thick.*

II. *The fore-wall and back-wall are in length* 15 *foot,*

foot being added amount to 30, *which drawn into the height* 7 *foot, produces* 210 *foot at two bricks and a half thick.*

III. *There is alſo a Partition of brick in this Cellar, which contains* 105 *feet, at one foot and a half thick: The* Queſtion *is, how many feet is contained in this Brickwork being reduced to a brick and a half, and conſequently how many ſquare Rods therein?*

To reduce a Brickwall there are two ways.

I. You may ſay by the Line of Numbers, if 3 gives 4, (*viz.* 2 brick thick) what ſhall 406 *feet* give? *facit* 541 3 tenths at 1 brick and a half.

II. Say, If 3 (*viz.* the number of parts that a brick and a half is ſuppoſed to be divided into) is to 5, (*i. e.* the parts of 2 bricks and half:) ſo is 105 to 175, at 1 brick and half. The ſum of theſe 2, together with the *Partition* 1 brick and a half thick, amounts unto 821. 3 tenths, and ſo many ſquare *feet* are therein, being all reduced to 1 brick and a half; which divided by 272, (as is uſual among Meaſurers, although 272 one fourth is the true ſquare *foot* in a Rod of 26 *foot* and half in length) the *Quotient* is 3 Rod and a ſmall matter more not conſiderable, *viz.* five 272 parts.

Otherwiſe reduce all theſe Walls into half a brick thick, *viz.* that of 406 *feet* at 2 bricks, will

be 1624 *feet*, at half a brick thick, which is done by multiplying 406 by 4.

Again, 105 multiplied by 4 for 2 bricks thick, produces 225, reduced to half a brick. And laſtly 105 multiplied by 3, the *Producti* is 315; all theſe added together amount to 2464 *feet*, (all being reduced to half a brick) which divided by triple 272, *viz.* 816, the *Quotient* is 3 Rod and ſomewhat more as before.

And according to either of theſe plain familiar ways, you may operate in reducing of a brick Wall of any thickneſs, and alſo compute the *feet* or Rod contained therein: or having firſt reduced the *Content* of the ſeveral Walls into half a brick thick, and ſo obtained the *Producti*, if you deſire to know how many *feet* is contained therein at 1 brick and half, 'tis by dividing that *Producti* by 3, thus: 2464 divided by 3 (the parts of 1 brick and half) the *Quotient* is 821 one third, *viz.* 821 and 3 tenths, *&c.*

Further, note that having the ſuperficial *Content* of any Brickwork in *feet*, reduced to a brick and a half, and you deſire to turn it into Rods without the help of *Diviſion*, but rather by *Multiplication*; then multiply your number of *feet* given, by this number 3673, abating or cutting off (as a Decimal part of a Rod) 8 figures towards your right hand, and you ſhall have the ſquare Rods and parts exactly true, within leſs than 100 part of a Rod, a thing inconſiderable.

Example.

Example.

I have a piece of Brickwork which contains 6043950 ſquare *feet*, at a brick and a half, how many Rods are contained therein? *facit* 222. as appears by the work of *Diviſion.*

```
                                  Rod:
272|25)   6043950 (222
          54450
          -----
          59895
          54450
          -----
           54450
           00000
```

But ſee how near *Multiplication* agrees.

```
        6043950
           3673
        --------
        18131850
       42307650
      36263700
     18131850
     ---------
221|99428350
```

Thus you ſee what an inconſiderable difference is between *Multiplication* and *Diviſion* in this particular.

And this number is found by dividing a *Unite* with *Cyphers* added at pleaſure by 272,25 the *Quotient* is 00003673, *&c.*

Queſtion III.

How many Bricks will make a ſquare Rod of Brickwork, at one brick thick (viz.) *the bricks length?*

TO eſtimate this there are Tables already extant, ſome allowing 3000, others 2900 or thereabouts, to compleat a Rod of Brickwork at a brick thick.

But for their ſatisfaction that are but beginners in theſe matters, for whoſe ſakes this Diſcourſe was chiefly intended, I ſhall endeavour to point out a way that may nearly hit the mark.

Firſt, let the ends of the bricks be conſidered, *viz.* their breadth and thickneſs, but their length ſuppoſe to be the thickneſs of the Wall.

Secondly, Suppoſing 4 bricks in thickneſs with allowance for Mortar makes 1 *foot*.

Thirdly, let 2 bricks and about 3 quarters Mortar and all in breadth, (conſidered at the end) likewiſe make another *foot*, and this I judge is very near the matter.

Fourthly, Multiply the long *feet* in a Rod, *viz.* 16.5 by 4, that produces 66 bricks in thickneſs, to make 16 *foot* and half one way.

Fifthly, Multiply 16.5 by 2.75 or 2 bricks 3 quarters, and the Product is 45.38 *ferè*, that is,

45

45 bricks and about a quarter, laid breadth to breadth, mortar and all: Now having a Rectangle made of the number of bricks, in breadth and thickneſs, mortar and all conſidered, in long Rod; I multiply the one into the other, and that produces the number of bricks in a ſquare Rod at the aforeſaid thickneſs, *viz.* Multiply 45.375 by 66, the Product is 2994:75. And ſo many bricks will make a ſquare Rod of Brickwork: but conſidering the waſte that is made in the work, I may well allow with Mr. *Philips* 3000.

Queſtion IV.

I have agreed with a Labourer to dig a Cellar, whoſe breadth is 26 *foot, the length* 30. *and depth* 8 *foot, at a certain rate by the Load, ſuppoſing* 3 *foot ſolid to contain a Load: the* Queſtion *is, how many Load are contained therein?*

THis is very eaſily reſolved by *Multiplication* and *Diviſion* upon the Line thus:

Example.

I. Extend the Compaſſes from 1 to 16, the breadth, the ſame *Extent will* reach from 30 the length, to 780, the ſuperficial *Content* of the piece of Ground to be dug.

II. Ex-

II. Extend the Compaſſes from 1 to 780, and that *Extent* will reach from 8 the depth, to 6240 the Solid Inches in the Cellar.

III. To reduce them into Solid Yards, I extend the Compaſſes from 27 the Cube *foot* in a Yard, to 1, and that *Extent* will reach the ſame way from 6240, to 231 and better; and ſo many Load therefore are contained in that Cellar.

Queſtion V.

I. *There is is a piece of Timber 3 foot long, 5 inches in breadth, and 7 inches in depth.*

II. *There is another piece 4 foot in length, 6 inches in breadth and 4 deep.*

III. *There is another piece 9 foot in length, 4 inches in breadth, and 6 inches deep.*

IV. *There is another 8 foot in length, 7 inches deep, and 5 inches in breadth.*

The Queſtion *is how many ſuch ſeveral pieces, having of each ſort a like quantity, there muſt be to make 10 Tun of Timber, at 40 foot to the Tun?*

See the Work.

Add

1	2	3	4
12	12	12	12
3	4	9	8
36	48	108	96
5	6	4	5
180	288	432	480
7	4	6	7
1260	1152	2592	3360

Add all these Products together thus:

1260
1152
2592
3300

Total 8364

Having thus found the Cubick Content of the 4 several pieces of Timber in inches, and added them together; let the said sum be the Divisor, and 691200 (the Cube Inches in 10 Tun of Timber) be the Dividend, and the Quotient will be $82\frac{1312}{1\,3\,2\,4}$ *viz.* nearly 83 of a sort, the Answer to the Question.

Note that if you multiply 1728 the Cube Inches in a Solid Foot by 40, the Feet in a Tun of Timber, the Product is 69120, which again multiplied by 10, by adding a Cypher, produces the Number or Dividend before mentioned.

Quest.

Question VI.

If a Piece of Timber be 10 *foot long, and* 8 *Inches broad, and* 5 *Inches deep, how many Foot of Timber of* 8 *Inches ſquare will be therein?*

Anſwer, 9 Foot and almoſt a half.

Question VII.

If a piece of Timber 8 *Foot long, and* 8 *Inches broad at one end, and* 6 *Inches at the other, and* 6 *Inches deep at one end, and but* 4 *at the other, how many Foot of Square Timber is in ſuch a piece; 'twill be found* 1 *Foot* $\frac{94}{100}$ viz. near 2 Foot.

Question VIII.

I have 6 *pieces of Timber, each of them* 10 *Foot long, ſquaring* 6 *Inches, I would exchange them for other pieces* 8 *Foot long, ſquaring* 4 *Inches,*

how

how mony muſt I have of that ſort?

Anſwer, 17 Pieces almoſt, or 16 $\frac{1344}{1153}$.

Queſtion IX.

There is a piece of Timber 12 *foot long, ſquaring* 8 *Inches, is to be converted into a round piece* 8 *Inches Diameter; how mady Feet of Timber is in ſuch a piece?*

Anſwer, 4 Foot $\frac{1}{2}$ of a Foot.

Queſtion X.

There is a piece of Timber 8 *Foot long,* 7 *Inches broad, and* 5 *Inches deep, how many ſuch pieces are in a Tun of Timber, being* 40 *Foot in length,* 12 *Inches broad, and* 12 *Inches deep?*

Anſwer, 20, and above a half, *viz.* $\frac{192}{313}$.

Queſtion

Queſtion XI.

There is a piece of round Timber 18 *Foot in length, Tapering, and the Diameter in the middle* 11 *Inches, how many Feet of ſquare Timber is in the piece?*

Anſwer, Almoſt 12, or 11 $\frac{1127}{1731}$.

Queſtion XII.

There is a piece of Timber of 5 *equal Sides, each* 10 *Inches, and the Semidiameter* 8 *Inches, and the length of the piece* 12 *Foot, how many Foot of ſquare Timber is in that piece?*

Anſwer, 16 $\frac{2}{3}$.

Queſtion XIII.

Suppoſe the Diameter of a Room be 18 *Foot, how many Foot of Board will floor the Room?*

Anſwer, 254 $\frac{8}{12}$.

Note,

Note, that if you would find the *Area* of an *Ellipſis* or Oval Form, take both the Tranſverſe and Conjugate Diameters; multiply one into the other, and extract the Square Root, and that ſhall be the Diameter of the Oval reduced to a Circle; by which you may find the *Area*; as is ſhewed by one of the former Problems.

Example.

Let the longeſt Diameter be 36 Inches, and the ſhorteſt Diameter 16, theſe multiplied one into the other, produces 576; the Square of the Diameter of a Circle 24 Inches equal in *Area* to the Oval, and the *Area* will be 452 Inches, 4 Tenths *ferè*, or $452\frac{384}{1000}$.

Queſtion XIV.

There is a May-pole 100 *foot high, from which a piece is broken off, ſo that the Top thereof hangs down upon the ground* 17 *Foot from the Body of the May-pole; the Queſtion is, how much is broken off, and how much ſtanding?*

THis is only to reſolve a Plain Right Angled Triangle, having 2 ſides given in one ſum, and the

the other ſide apart, to find each of the other ſides given together.

For Reſolution of this Queſtion, ſquare the 2 ſides given together; ſquare the Baſe alſo, and ſubſtract the ſquare of the Baſe from the ſquare of the ſum of the ſides, and divide the Remainder by double the ſum of the ſides given, the *Quotient* is the Anſwer, *viz.* the quantity broken off, which ſubſtracted from the whole, the remainder is that part that remains ſtanding; and thus it will be found that 51 Feet and $\frac{1}{5}$ almoſt is broke off, and 48 and $\frac{1}{5}$ and better is left ſtanding.

Queſtion XV.

Three Carpenters, A B C, *bought a Grind-ſtone, whoſe Diameter was* 42 *Inches, for* 30 *ſhillings,* viz. A *paid* 15 s. B *paid* 10 s. C *paid* 5 s. *The Queſtion is, how much each man muſt grind down? Suppoſing* A *to be ſerved firſt,* B *ſecond, and* C *laſt of all.*

TO work this Queſtion, firſt find the *Area* of the whole Circle; then divide the *Area* according to the proportion of each man's Mony; having ſo divided the *Area* into their ſeveral parts,

parts, find the *Diameters* of each of those Circles agreeable to their several *Areas*; Lastly, Subduct the *Diameter* that appertains to *A*, out of the whole *Diameter*, and $\frac{1}{2}$ the Remainder is the inches and parts to be ground down for his share. Again, Substract the *Diameter* appertaining to the least man's share, *C*, out of the *Diameter* appertaining to *A*, the first man, and $\frac{1}{2}$ the Remainder will be the inches and parts that *B*, the second man must grind down. And lastly, $\frac{1}{2}$ the *Diameter* appertaining to *C*, the last man's share is the quantity of inches and parts left remaining next the Spindle for his share; and hence you will find (that please to try) the whole *Area* 1386 Inches.

The *Areas* belonging	unto	*A*	693	*Diameter*	12, 30.
		B	462		12, 56.
		C	231		17, 14.
Their Total					42. 00.
Equal to the whole,			1386.		

The Halfs of which *Diameters*, *viz.* 6 inches, 15 parts for *A*, 6, 28 for *B*, and 8, 57 for *C*, are the true quantities that every man ought to grind down proportionable to the several sums of Money they paid.

R Question

Queſtion XVI.

Admit I have an Irregular diſordered ſmall Solid to be meaſured, what is the way and manner of meaſuring thereof?

TO meaſure ſuch kind of Solids, the beſt way to perform it is, by the help of Water, in a prepared Veſſel, thus; *viz.*

Firſt, Prepare a Veſſel exactly Cubical, ſo large that it may contain the ſaid Irregular body therein; having ſo done, put it into the prepared Cubical Veſſel, and pour in ſo much water as may juſt cover the ſame, and make a mark where the Superficies of the water touches your Veſſel.

Having ſo done, take out the ſame Irregular Body, and make a ſecond mark where the upper ſuperficies of your water cuts the ſide of your Veſſel; then by your Rule meaſure the diſtance of theſe two Marks in inches and parts, which you are to multiply by the ſquare of the ſide of your prepared Veſſel, and that Product ſhall be the ſolidity of your Irregular Body deſired.

Example.

Admit my hollow Veſſel made in an exact Cubical form, the inward ſides thereof be 20 Inches, then

then putting in my irregular ſmall Solid (let it be of what diſordered form you can imagine) I continue pouring water till it be completely covered, and there I make a mark, then taking out the Body again, I obſerve how much the water is ſunk, which ſuppoſe to be 7 inches, which I multiply by the ſquare of the ſide 20, *viz.* 400 and that produces 2800 Cube inches, and ſo many inches therefore are contained in the ſaid Solid. Many other Varieties of this kind of Meaſuring might be inſerted, and their application, which is of ſingular uſe in the performance of many ſtrange Concluſions thereby; but I ſhall only preſent you with one more, as a taſte, and ſo conclude at this time, till a farther opportunity is offered.

Queſtion XVII.

Admit I have a Solid whoſe weight is given, but I deſire the weight of a certain portion or fragment thereof, without ſeparating or cutting it off from the whole.

TO perform which, Having the weight of the the whole 100 pound, I proceed after this manner; I put the whole Body (let it be a Pillar of Braſs or Iron, *&c.*) into my aforeſaid pre-

pared Veſſel, and fill it full of water, then I gently lift it up till all be out of the water, ſave that portion I deſire the weight of, and then I note how much the ſuperficies of the water is fallen; and laſtly, I take it all out of the water, and again note how much more the water is ſunk upon the inſide of the Veſſel, &c. Now ſuppoſe at the firſt lifting up of the Solid, the water falls from the top 12 Inches, and at the ſecond, 8 Inches more from that; which from the top is 20 Inches, I multiply 8 by 100, the whole weight produces 800, which divided by 20 Inches, the greater diſtance from the top to the loweſt mark, and the *Quotient* is 40, and ſo many pound weight is the portion or fragment thereof; but here you are to ſuppoſe the whole Body of one and the ſame ſubſtance, not mixt; if it be a mixt Body, 'twill require a more curious Calculation; and by this means *Archimedes* found the exact quantity of every Metal in the Crown without breaking it in pieces.

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FINIS.

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*Adverti*ſe-

Advertiſement.

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FINIS.

Of Measuring of Roofs

It is a Rule amongst Workmen that the Flat of any house and halfe the Flat thereof taken within the Walls is equal to the Measure of the Roof of the same House but this is when the Roof is true pitched For if the Roof be more flat or steep then the true pitch it will Measure to more or less accordingly

Example If a House within the Walls be 44 Foot 6 Inches long And 18 Foot 3 Inches broad how many Squares of Roofing will cover that House

Multiply the length and breadth together and the product is 812 foot the flat the halfe thereof is 406 foot which added to the Flat the Sum is 1218 Foot which Divided by 100 the Answer is 12 Squares and 18 Foot

Liber Johannis Sonnab

Anno Domini 1715

[illegible] are in an Acre of land
[illegible]o Square yards For 40
[illegible]ches in Length and 4 in
[illegible]adth make an Acre And
[illegible]ive yards and a halfe makes
a Pole or Perch that is Sixteen
foot and a halfe

John Bennet his
Anno 1715